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July 2012

Evaluation of Assessment Methodology to Support Combined Joint Task Force-Horn Of Africa

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Abstract

We conducted a review of their current assessment methodology with the goals of making recommended improvements and develop a means to aggregate their assessment methodology in support of the J5, Combined Joint Task Force – Horn of Arica, US Africa Command. This research demonstrates an approach to capture the many political, social, and economic factors that exist for this nation and others in the region face and to capture and convey a quantitatively based measure of nation stability. The product developed is intended to be utilized by the defense and other agencies and private organizations interested in the stability of a country. We used multi objective decision analysis to develop a weighted scoring methodology using Kenya for a proof of principal demonstration study. This methodology is an improvement over existing methodologies in that it uses a weighed scoring in lieu of a simple additive model. We also investigated numerous means to best convey the results to include spider plots, bubble charts, stacked bar graphs, and stop light charts to capture both the change in stability as well as the magnitude of the change.

The research was conducted under the guise of the Cultural Reasoning and Ethnographic Analysis for the Tactical Environment is effort of the Engineer Research and Development Center (ERDC) that started in June 2011. This effort will provide knowledge, methods, and computational tools to inform planning for civil-military operations.

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About Us

The Superintendent of the United States Military Academy (USMA) at West Point officially approved the creation of the Center for Nation Reconstruction and Capacity Development (C/NRCD) on 18 November 2010. Leadership from West Point and the Army realized that the United States Army, as an agent of the nation, would continue to grapple with the burden of building partner capacity and nation reconstruction for the foreseeable future. The Department of Defense (DoD), mainly in support of the civilian agencies charged with leading these complex endeavors, will play a vital role in nation reconstruction and capacity development in both pre and post conflict environments. West Point affords the C/NRCD an interdisciplinary and systems perspective making it uniquely postured to develop training, education, and research to support this mission.

The mission of the C/NRCD is to take an interdisciplinary and systems approach in facilitating and focusing research, professional practice, training, and information dissemination in the planning, execution, and assessment of efforts to construct infrastructure, networks, policies, and competencies in support of building partner capacity for communities and nations situated primarily but not solely in developing countries. The C/NRCD will have a strong focus on professional practice in support of developing current and future Army leaders through its creation of cultural immersion and research opportunities for both cadets and faculty.

The research program within the C/NRCD directly addresses specific USMA needs:

- Research enriches cadet education, reinforcing the West Point Leader Development Systems through meaningful high impact practices. Cadets learn best when they are challenged and when they are interested. The introduction of current issues facing the military into their curriculum achieves both.
- Research enhances professional development opportunities for our faculty. It is important to develop and grow as a professional officer in each assignment along with our permanent faculty.
- Research maintains strong ties between the USMA and Army/DoD agencies. The USMA is a tremendous source of highly qualified analysts for the Army and the DoD.
- Research provides for the integration of new technologies. As the pace of technological advances increases, the Academy's education program must not only keep pace but must also lead to ensure our graduates and junior officers are prepared for their continued service to the Army.
- Research enhances the capabilities of the Army and DoD. The client-based component of the C/NRCD research program focuses on challenging problems that these client organizations are struggling to solve with their own resources. In some cases, USMA personnel have key skills and talent that enable solutions to these problems.

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Table of Contents

Chapter	Topic	Page
	Abstract	i
	About Us	iii
1	Introduction	1
2	Literature Review	7
3	Model Development.....	11
4	Demonstration Study.....	17
5	Conclusion and Summary	55
6	References	57

List of Appendices

Chapter	Topic	Page
A	Raw Data Input.....	59

List of Figures

Number	Figure Title	Page
1.1	Assessment process	1
1.2	Areas of responsibility and interest	2
1.3	The USMA systems design process	3
1.4	Systemigram for African relations	5
2.1	Screenshot of the Pilgrim's Global Stability Index	9
3.1	Overview of AFRICOM assessment measures	11
3.2	Level of assessment and corresponding cycle time	12
4.1	Kenya's ethic group boundaries	21
4.2	Fundamental objective for our Kenya model	23
4.3	Value hierarchy model	23
4.4	Value hierarchy model showing the value measures for the economic stability function	24
4.5	Value hierarchy model show the value measures for the political unrest function	25
4.6	Value hierarchy model show the value measures for the social well being function	26
4.7	Value hierarchy model show the value measures for the security/stability function	27
4.8	Value graph for national terrorism revenue	28
4.9	Value function for International Investment in Kenya	29
4.10	Value function graph and recent data for inflation rate	30
4.11	Value graph for average annual income	30
4.12	Value function for unemployment	31
4.13	Health score value function	32
4.14	Political unrest value function	33
4.15	Governmental action value function	34
4.16	Military and governmental corruption value function	35
4.17	Graphical value measure representation for percentage of population	

	below poverty line	36
4.18	Graphical value measure representation for labor participation rate	37
4.19	Graphical value measure representation of number of AIDs deaths	38
4.20	Graphical value measure representation of the life expectancy of Kenya population	39
4.21	Graphical value measure representation of the literacy rate value of the Kenya population	40
4.22	Value measure of the number of attacks per month	40
4.23	Value function for members in the military to members in the workforce ratio	41
4.24	Value measure for the defense budget	42
4.25	Value measure for the amount of internet access	42
4.26	Value function for protection agency	43
4.27	Value function for the number of pirate attacks	44
4.28	Amount of drugs imported and exported	45
4.29	Example of regional breakdown of Kenya	47
4.30	Kenya stability profiler	49
4.31	Kenya stability score from 2007 to 2010	50
4.32	Fund for peace failed states index on Kenya	52
4.33	Total value stacked bar chart	53
4.34	Fund For Peace failed states index for Kenya	54

List of Tables

Number	Table Title	Page
3.1	Elements of a swing weight matrix	14
3.2	Swing weights values	15
4.1	Swing weight matrix for Kenya stability index value model	46
4.2	Stop light chart for our assessment value measures from 2007 to 2010	51
A.1	Government and politics sub function raw data	59
A.2	Economy sub function raw data	59
A.3	Social well being sub function raw data	60
A.4	Security sub function raw data	60
A.5	Excel implementation of the value model	61

Chapter 1 Introduction

1.1 Problem Statement and Overview

The purpose of this research is to use multi-objective decision analysis (MODA) to develop a quantitatively based and defensible stability scoring methodology and index for the nation of Kenya. The intent is to demonstrate an approach to the many political, social, and economic problems that this nation and others in the region face and to capture and convey a quantitatively based measure of nation stability. The products developed here are intended to be utilized by the defense and stability operations community as a means to predict the potential for conflict in regions such as Kenya and sub Sahara Africa.

As shown in Figure 1.1 assessment is conducted at all levels and drives a host of operational and strategic issues. This research was focused on conducting macro level assessment.

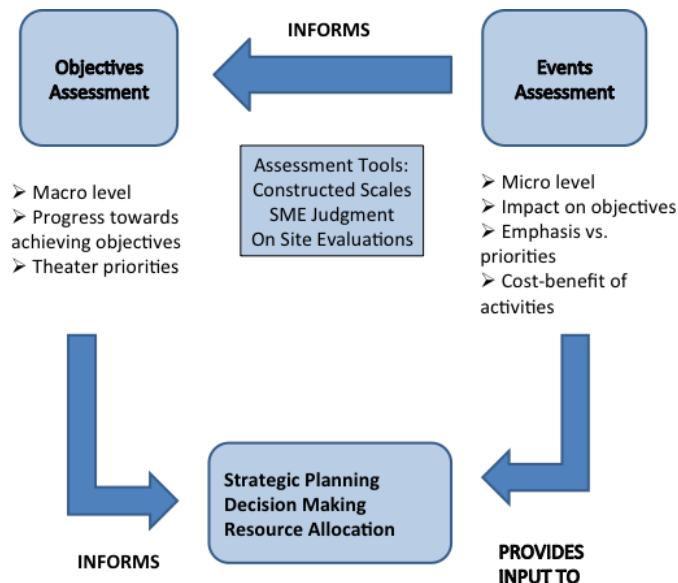


Figure 1.1 Assessment process

Specifically, this research was conducted to develop implementable and sustainable methods, processes, and tools (MPTs) for the Department of Defense (DoD) to utilize in order to predict instability. These MPTs have a real-time capacity to be updated and reshaped to produce a numeric value that dictates the desired stability level. This output number is the resulting likeliness that Kenya might be moving towards instability/stability. A visual model also accompanies the mathematical model to allow for a clearer understanding and real time viewpoint of the math behind the evaluation and the interactions between the different factors involved.

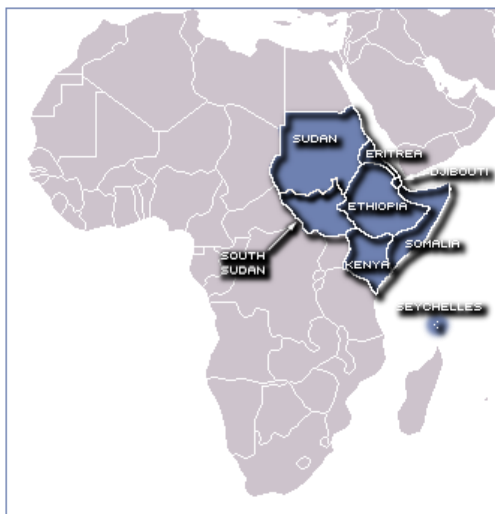
Combined Joint Task Force - Horn of Africa (CJTF-HOA) is the only official permanent DoD presence on the continent of Africa and is responsible through U.S. Africa Command (AFRICOM) for the assessment of U.S. Government military activities. Through Civil Affairs (CA) teams, open sources, other government agencies, etc., they are responsible for assessing how government projects contribute to security, improved governance, and economic development. They should also contribute to the situational

awareness as a key member of the government team. Another purpose of this research is to review and make recommendations to the current assessment methodology, in hopes to replace it with a user-friendly, transparent, sustainable, quantifiable, and most importantly relevant set of MPTs.

AFRICOM is one of six unified Combatant Commands (COCOMs) that are regionally focused; it is devoted solely to Africa. AFRICOM is responsible to the Secretary of Defense for U.S. military relations with 54 African countries. USAFRICOM better enables DoD to work with other elements of the U.S. government and others to achieve a more stable environment where political and economic growth can take place. AFRICOM is committed to supporting U.S. government objectives through the delivery and sustainment of effective security cooperation programs that assist African nations build their security capacity to enable them to better provide for their own defense. The mission of AFRICOM is to protect and defends the national security interests of the United States by strengthening the defense capabilities of African states and regional organizations and, when directed, conducts military operations, in order to deter and defeat transnational threats in order to provide a security environment conducive to good governance and development.¹

U.S. AFRICOM commands CJTF-HOA which is stationed in Camp Lemonnier in Djibouti City, Djibouti. CJTF-HOA's mission is to conduct operations in the combined joint operations area in order to enhance partner nation capacity, promote regional stability, dissuade conflict, and protect U.S. and coalition interests.² The area of responsibility for CJTF-HOA is Djibouti, Eritrea, Ethiopia, Kenya, Seychelles, Somalia, South Sudan, and Sudan. CJTF-HOA's area of interest consists of Burundi, Chad, Comoros, Democratic Republic of the Congo, Madagascar, Mauritius, Mozambique, Rwanda, Tanzania, Uganda, and Yemen.³ Figure 1.2 shows the area of responsibility and interest.

Area of
Responsibility



Area of
Interest

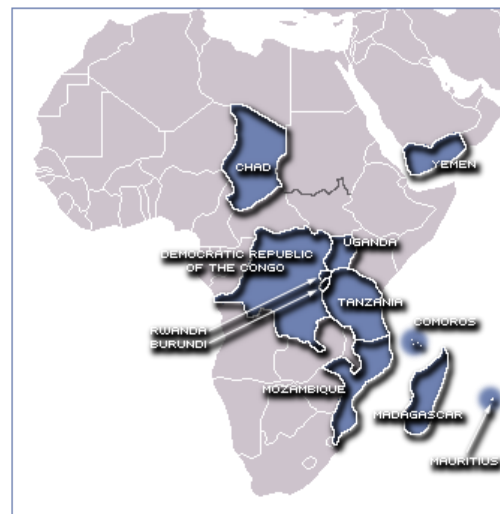


Figure 1.2 Areas of responsibility and interest⁴

¹ U.S. Army African Command, "About US AFRICOM," U.S. AFRICOM, accessed November 2011, <http://www.africom.mil/AfricomFAQs.asp>.

² U.S. Army African Command, "About US AFRICOM," U.S. AFRICOM, accessed November 2011, <http://www.africom.mil/AfricomFAQs.asp>.

³ U.S. Army African Command, "About US AFRICOM," U.S. AFRICOM, accessed November 2011, <http://www.hoa.africom.mil/hoaAORAOI.asp>

⁴ Ibid.

CJTF-HOA is currently conducting a myriad of operations in the AFRICOM area of responsibility (AOR) to include building partner capacity (BPC) operations along with some limited stability operations. Conducting TSC operations is one of the most important tools the DoD because it is focused on engaging other countries to deter unwanted actions and to defend the United States' and our allies' national interests. Theater security cooperation primarily builds relationships that promote specified U.S. interests. Stability operations are conducted in order to eventually give the host nation control when a legitimate government exists without the help of the U.S. Marine Gen. Peter Pace, the 16th Chairman of the Joint Chiefs of Staff, said to his troops, "We are operating in Afghanistan and Iraq right now because the international community was not able to get those nations straight before it was necessary to use force." He continued, "We'll get through Iraq. We'll get through Afghanistan, but then we're going to need nations like Djibouti in places around the world to help our nation and their nations prevent the kind of conflict that we're fighting right now."⁵

1.2 Research Methodology

The Systems Decision Process (SDP) is a structured process used in the conduct of this research. It is a comprehensive and proven method for problem solving and decision-making. It is flexible enough to accommodate the needs of almost any problem and is shown in Figure 1.3.⁶

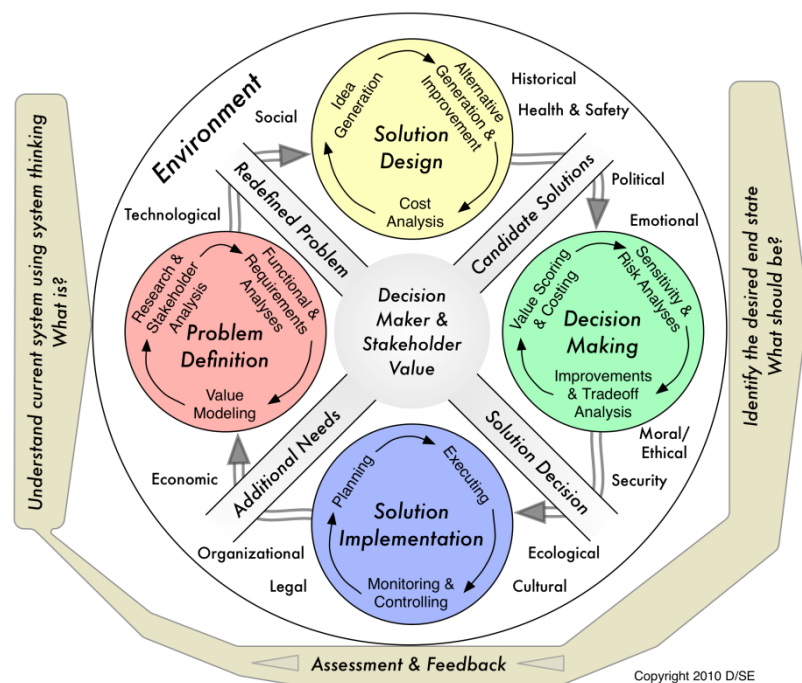


Figure 1.3 The USMA systems design process

Problem Definition for the Kenyan Stability Model began in the summer of 2011 when we were tasked with developing an adaptive, real time weighted scoring solution to evaluating stability in Kenya for CJTF-

⁵ Jim Garamone, "Troops Play Important Role in Horn of Africa Mission, Chairman Says," U.S. Department of Defense, accessed November 2011, last modified August 14, 2007, <http://www.defense.gov/news/newsarticle.aspx?id=47047>.

⁶ Parnell, Gregory S., Patrick J. Driscoll, and Dale L. Henderson. *Decision Making in Systems Engineering and Management*. Second Edition. New York: John Wiley and Sons (2010), p. 17.

HOA. We conducted background research on U.S. policy to date, the surrounding regions (Somalia, Rwanda, Sudan, etc), the role of religion, terrorism, Kenya's history, etc. We presented our findings to various stakeholders and subject matter experts while also researching literature on Kenya. We first began by developing a comprehensive Systemigram, which allowed us to develop an initial scaffold of the weighted value model.

After submitting our initial work and receiving feedback from the J-5 at CTJF-HOA, we had our research statement clearly defined to create a tool for assessing Kenya's stability.

During *Solution Design*, we used our stakeholder assessments along with a literature review to update and update our problem statement and a develop a functional hierarchy.

The *Decision Making* phase is left to the analysts working for CTJF-HOA. Time constraints, limited our work to the creation of the multi objective decision analysis (MODA) model. Future work in this area involves interpreting the output and determining the significance of specific numerics. Sensitivity analysis is also a possible area of future work.

Solution Implementation is left to the CJTF-HOA stakeholders. The MODA model and scoring system provides them the tools that can easily be modified and used to analyze operations in Kenya and other countries in their area of operations.

1.3 Current Situation: Kenya and the United States

Understanding Kenya's political makeup in relation to the U.S. is crucial in interpreting the value model and indicators chosen to represent stability within the nation.

Post September 11th the Bush administration began soliciting Kenya for increased partnership in counterterrorism efforts in the Horn of Africa region. In turn the Kenyan government has increasingly relied on the U.S. for financial support and advocacy on the world stage.

Looking back to 1970, the U.S. has maintained military access agreements with the Kenyan government that permits the U.S. military to use Kenyan sea and air bases. These facilities were used extensively in administering humanitarian assistance to Somalia in the early 1990s, to Rwanda post-1994, and to Sudan. Cooperation in confronting terrorists adds a layer of complexity to the U.S.-Kenyan relationship, but the relationship will almost certainly be sufficiently strong to withstand complex and sometimes seemingly competing policy interests.⁷

While Kenya still remains a stable nation its borders with Somalia, Ethiopia and the Sudan apply a constant pressure of extremism and terrorist sympathy because its resources are constantly being taxed by the influx of refugees, displacement of indigenous people because of development, religious ideology, and population growth. We must be prepared to handle all scenarios and adjust to Kenya's future action, making this model crucial to identifying potential issues or instability as early as possible. It is our goal to provide an accurate, precise and adjustable model that can be used to guide future policy initiatives and military actions in the future.

Figure 1.3 is a Systemigram showing a visual representation of the interactions between the functions of the system. It also provides an interface to analyze an understand relationships between all aspects of Kenyan society that we investigated. In the Systemigram we can see that the principle indicator for political and internal relations is economic stability. While government and security sectors play a vital role

⁷ Barkan, Joel D., Cooke Jennifer G. *U.S. Policy Towards Kenya in the wake of September 11th: Can New Antiterrorist Imperatives be Reconciled with Enduring U.S. Policy Goals*. Washington DC: Center for Strategic & International Studies (2001 December), p 1-6.

in dictating the stability of the continent it is a direct result of the economic policies and interactions that take place.

The Systemigram was developed to convey a synergy of prose and pictures, furthermore embodying the best features of each. It is critical to note that the Systemigram must be correlated to the text that it represents, “recovery of the original prose by inspection of the diagram a key requirement.” Those requirements are:

Rules for Prose

1. Address strategic intent, not procedural tactics.
2. Be well-crafted, searching the mind of reader and author.
3. Facilitation and dialogue with stakeholders (owner/originator of strategic intent) may be required to create structured text.
4. Length variable but less than 2000 words; scope of prose must fit scope of resulting Systemigram.

Rules for Graphic

1. Required entities are nodes, links, inputs, outputs, beginning, and end.
2. Sized for a single page.
3. Nodes represent key concepts, noun phrases specifying people, organizations, groups, artifacts, and conditions.
4. Links represent relationships and flow between nodes, verb phrases (occasional prepositional phrases) indicating transformation, belonging, and being.
5. Nodes may contain other nodes (to indicate breakout of a document or an organizational/product/process structure.
6. For clarity, the Systemigram should contain no crossover of links.
7. Based on experience, to maintain reasonable size for presentation purposes, the ratio of nodes to links should be approximately 1.5.
8. Main flow of Systemigram is from top left to bottom right.
9. Geography of Systemigram may be exploited to elucidate the “why,” “what,” “how” in order to validate the Transformational aspect of the systemic model.
10. Color may be used to draw attention to subfamilies of concepts and transformations” (Blair, Boardman, & Sauser, 2007, pp. 4,5).

To better understand the inter-relationships of these functions a Systemigram and a value model were developed. Conflict in Sudan is far from a simple problem. There are many factors that influence other factors and add or take away from the possibility of civil war. The Systemigram attempts to mitigate some of the confusion by providing a visual representation of the problem in Southern Sudan that enables us to examine the links and interactions between the functions and indicators of the system. The intent of the Systemigram is to show the interactions between the indicators and help validate the method of scoring using the value model.

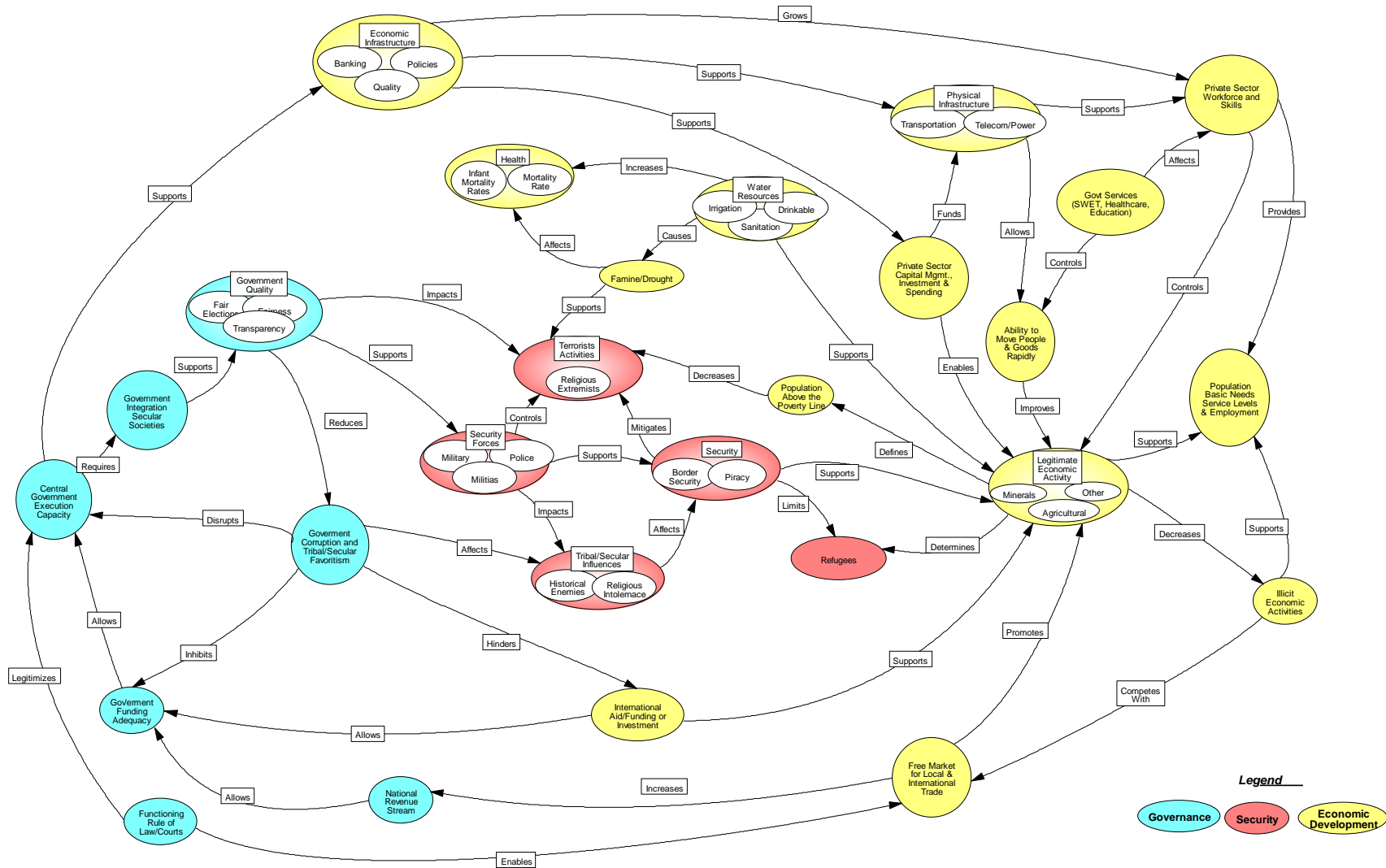


Figure 1.4 Systemigram for african relations

Chapter 2

Literature Review

2.1 Introduction

Continuous assessment is used extensively by the international community for predicting and understanding stability; especially for developing countries. A wide variety of additive global indexes exist in the open literature. The methodologies are often used by organizations to determine whether to invest in a particular region, an assessment of whether policies are working, etc. These methodologies are mainly additive in nature and do not incorporate the use of weighting to slant the influence of most important measures. Weighting the assessment measures is key to more accurately portraying the current situation. This chapter provides a literature review of the various methodologies that exist in the literature.

2.2 Existing Assessment Methodologies

2.2.1 Fund for Peace Failed States Index

The Fund for Peace (FFP) is an organization that is independent of the U.S. government that allows it to be nonpartisan when ranking countries. Established in 1957, the FFP is a nonprofit research and educational organization that works to prevent violent conflict and promote sustainable security. They go about accomplishing their mission/objective through research, training and education, engagement of civil society, building bridges across diverse sectors, and developing innovative technologies and tools for policy makers. The FFP works towards sustainable security and development in failed states by focusing on conflict assessment and early warning, transnational threats, peacekeeping, and security and human rights. The FFP maintains programs in Nigeria, Uganda, Liberia, and works with private business in conflict zones to better secure the interests of businesses, local populations, and their governments. The FFP adopts a holistic approach to the issues stemming from weak and failing states. We work at both the grassroots level with civil society actors and at policy levels with key decision makers. Combining social science techniques with information technology, the FFP has produced the patented Conflict Assessment System Tool (CAST), a content analysis software product that provides a conceptual framework and a data gathering technique for measuring conflict risk.

The FFP offers a wide range of initiatives focused on our central objective of promoting sustainable security, the ability of a state to solve its own problems peacefully without an external military or administrative presence. Our activities relate to three interconnected themes: Conflict Early Warning and Assessment, Transnational Threats, and Sustainable Development, Sustainable Security.

As part of the conflict early warning and assessment system, the FFP produces the annual Failed States Index that is published by Foreign Policy magazine. The Failed States Index ranks 177 countries across 12 indicators that are based on stability and capacity. This index is used all across the world from researchers, academia, to government officials. The Failed States Index assesses the pressures experienced by nations based on social, economic, and political indicators such as demographic pressures, refugee flows, uneven economic development or severe economic decline, and human rights. These are part of the 12 indicators the Failed States Index uses. Each indicator has, on average, 14 sub-indicators. The first Failed States Index was published in 2005 and the last one was published June 21, 2012.

The Failed States Index is based on The FFP's proprietary CAST analytical platform. Based on comprehensive social science methodology, the content analysis is further triangulated with two other key aspects of the overall assessment process: quantitative analysis and qualitative inputs based on major events in the countries examined. The scores produced by the FFP's software are then compared with a comprehensive set of vital statistics—as well as human analysis—to ensure that the software has not misinterpreted the raw data. Though the basic data underpinning the Failed States Index is already freely

and widely available electronically, the strength of the analysis is in the methodological rigor and the systematic integration of a wide range of data sources.

Countries get scored in each indicator. Each Indicator is rated on a 1 to 10 scale with 1 (low) being the most stable and 10 (high) being the most at-risk of collapse and violence.

2.2.2 Sudan Conflict Indication Model

A key component in the development of our Kenya model came from a previous methodology used in the Sudan (Dean et al, 2011). Specifically, our model and the Sudanese Conflict model both assess desired measures for an aggregate score while also providing insight into the societal norms that dictated past behavior. Below is a detailed description of the Sudanese Conflict Indication Model to provide context for where our methodology was in part derived.

The model developed for the Sudanese conflict is centered on two prongs: a weighted value scoring method and a Systemigram to show a visual representation of the data to be collected. Previously, numerous tools existed with which to measure different statistics and compare them on a state-by-state basis after the fact. However, no tools to date have provided anything that actually predicts conflict. Rather, they simply allow users to compare statistics against other states. Conversely, the weighted value model developed here should provide a value prediction of possible conflict before it occurs.

Previous systems did not tailor their models to a specific state. What may fit a certain conflict may not necessarily have a similar impact or relevance in other conflicts. For example, the issue of cattle raids is extremely important in Southern Sudan. However, cattle raiding may not really be a problem or may not even exist in another nation. The model developed in this methodology addresses conflict indicators that are unique to Southern Sudan, providing us with the most accurate results possible.

The weighted value model uses indicators that were developed specifically for Southern Sudan. Additionally, the indicators in the model are weighted according to their significance against each based on the variability of the scoring range and the stakeholder importance. One major area where current models fail to provide clarification is in interactions between indicators. They view the different statistics and indicators as stand-alone separate entities. This is far from how real world conflict indicators function.

2.2.3 Political Instability Index

The Economist magazine created an index, the political instability index, in order to predict instabilities within the world's countries with a quantitative method. The index defines political instability as, "events that pose a serious extra-parliamentary or extra-institutional threat to governments or the existing political order."⁸ Most of the index measures are based on the work of George Mason University's Political Instability Task Force (PITF). This model has been proven to be successful for over 80% of the instabilities that have been present throughout countries from 1955.

The political instability index includes all four of the PITF model factors: the level of development as measured by the infant mortality rate; extreme cases of economic or political discrimination against minorities; a bad neighborhood (if a country has at least four neighbors who have all gone through violent conflicts); and regime type. It also includes eight other factors that contribute to political instability: inequality, a prior history of instability, ethnic fragmentation, poor governance, a proclivity to labor unrest, the level of provision of public services, state strength, and economic distress and dislocation.

The index score is based on a 0 (no vulnerability) to 10 (highest vulnerability) score with two indices, underlying vulnerability and economic distress, that are averaged into one overall index. From the various factors, the political stability index compiled fifteen indicators that conclusively made up the model.

⁸ Viewswire, "Political Instability Index: Vulnerability to Social and Political Unrest," *The Economist Intelligence Unit Limited*, 19 March 2009, http://viewswire.eiu.com/index.asp?layout=VWArticleVW3&article_id=874361472.

2.2.4 Pilgrims Global Stability Index

The Pilgrims Global Stability Index (PGSI) is a product of the Pilgrims Group. The Pilgrims Group, based out of the UK, is a specialist security risk management consultant firm. One of the many aspects of this corporation is their Global Stability Index which is a constantly updated world map showing stability levels in different categories.

The PGSI shows users stability levels for terrorism, crime, economics, and politics around the world. Each index is categorized into one of four different security levels based on stability. The index is extremely easy to use, once open there is simply a large map of the world. As seen in Figure 2.1 on the left hand side you may chose one of the aforementioned categories, or just overview, and once selected all the nations' colors will change to reflect one of the security levels which are identified in a legend.⁹



Figure 2.1 Screenshot of the Pilgrims Global Stability Index

This study appears to be an excellent tool and very similar to what is being created in this report specifically for Kenya. However since Pilgrims is a private corporation they do not release the method in which they calculate their indices or their value measures. And without that information it is difficult to determine on what basis they assess their indices.

2.4 Other Sources of Relevant Information

AFRICOM (2011) has developed an extensive list of standard indicators for planning and assessments for all regional, theater, and functional level plans. These standardized indicators simplify the data collection and analysis for AFRICOM analysts. Using a common data set is critical to not only minimizing data collection efforts but to ensure that common values are used for analysis. Because the document was classified SECRET we did not use those metrics.

⁹ Pilgrims Group, "Pilgrims Global Security Index," Pilgrims Group, accessed December 11, 2011, <http://www.pilgrimgroup.com/globalstabilityindex.php>.

2.4 Summary

Three of the four methodologies previously discussed are all similar in nature in that they are additive functions. They score quantitatively and qualitatively score different areas to come up with an overall score that attempts to predict conflicts. The difference between them is the method is solely based upon the measures used to produce the stability score. For example, the FFP uses 12 main indicators with an average of 14 sub-indicators that are taken into account when scoring the main indicator. Each indicator is scored 1 through 10 with 1 being the most stable and 10 being the least. The FFP does not weigh each indicator, meaning that each indicator has the same significance as another. The Sudan Conflict Indicator uses measures similar to the FFP except they weigh each indicator based on their level of significance. The more important indicator has a greater effect on the overall score than the less important indicator. The Political Instability Index (PII) uses 15 indicators four of which are from the George Mason University's PITF. The PII uses a scoring system from 0 to 10 with 0 indicating no vulnerability and 10 indicating the highest vulnerability. The PGSI scores countries in four categories: terrorism, crime, economics, and politics around the world. Each category is categorized into one of four security levels based on stability.

All of the indices except for the Sudan research used an additive scoring approach from open sources. A weighted index would be more accurate in trying to predict instability.

Chapter 3

Model Development

3.1 Current Assessment Methodology

3.1.1 Overview

The current assessment methodology utilized by the CJTF-HOA can be broken down into a number of different components. First, there are the steps taken to define the fundamental objectives for the region, describe their desired effects, and create different missions to accomplish said goals. After the problem definition is completed the process becomes entirely about assessment, which consists of both qualitative and quantitative information and data. For every objective and mission there are developed measures of effectiveness and measures of performance. These assessments are done at every echelon of the objective and then summarized to give overall effect levels for the fundamental objectives and for all of Kenya on a quarterly basis.

The specific objectives and missions used for the current assessment methodology are not based on specific issues or arising problems in Kenya. The results of the analysis are solely reviews of completed or in progress desired effects. The output does not give any indicators of future issues; it recaps progress on the effects of missions. The quarterly assessment results consist of a summarized description of the main objectives labeled based on their current progress in effectiveness, and the amount of evidence and confidence with which they can prove the effectiveness. A table describing engagements with key leaders and the purpose of those meetings, a table of the different effects desired for each Objective labeled based on the Measures of Performance, and written descriptions of different Civil-Military Operation Missions, Military-to-Military Operations, and other Objective Missions, with reports of their measures of effectiveness.

3.1.2 Objective and Effects Definition

The current process for objective definition comes from social and military needs in the region. Many missions come from AFRICOM and the current priority of such issues within the nations.

3.1.3 Assessment Process

The assessment process occurs on many different levels. The broadest of which is the overall assessment of the different objectives, missions, and effects. The first step is the quantitative labeling process, which measures 3 things; the level of effect the missions or objectives had, the evidence with which the effectiveness can be proved, and lastly the confidence with which the effectiveness can be proved. As shown in Figure 3.1, the quantitative measures of performance are seen below, where color represents effectiveness, and the letters 'E' and 'C' represent evidence and confidence respectively.

E	Significant Evidence		Significant Effect
e	Some Evidence		Some Effect
C	High Confidence		Negative Effect
c	Low Confidence		Insufficient Data

Figure 3.1 Overview of AFRICOM assessment measures

The missions are first assessed and given basic color coding and the main objective assessments are compilations of all the missions that fall under that objective, they are given both color coding and two letter labels to represent all three factors shown in the table above.

The next process is the qualitative descriptions. This is done in two major parts. First, a description is done of the overall effects of the different types of missions, a brief summary is written about Military-to-Military (M2M) effects in that quarter, followed by Civil-Military Operations (CMO), and then Functional Specialty (FXSP) teams like Medical or Veterinary actions. Following the broad overviews, the descriptions are broken down by objectives. For each objective a description is written about the impact of each of the three aforementioned areas (M2M, CMO, and FXSP).

These different assessment parts fit into a much larger scheme of analysis for the region. For each assessment cycle, components are analyzed on the tactical level, which conducts task assessment, looks at primarily quantitative data, and asks, “*Are the HOA Projects being done right?*” The operational level, which includes Effect Assessment, is both qualitative and quantitative analysis, and asks, “*Are we doing the right projects?*” Finally, the Strategic Level, which is the Campaign assessment, uses qualitative and quantitative data in addition to distribution of effort throughout the region, and asks, “*Are we accomplishing the mission?*” This three tier approach covers the spectrum working from the small tactical missions with civil affairs teams all the way up to a strategic view of the mission that deals with USAFRICOM’s mission. Figure 3.2, below, is a diagram directly taken from CJTF-HOA’s explanation of their current methodology.

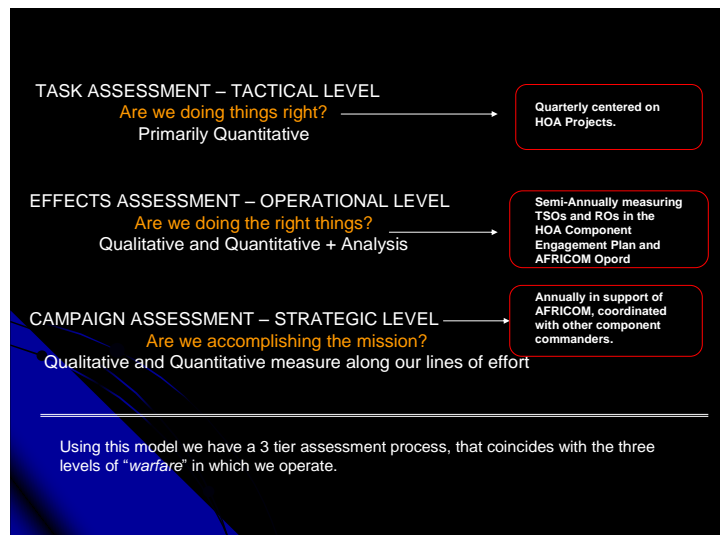


Figure 3.2 Level of assessment and corresponding cycle time

Another part of the assessment output, which goes along with the tables of labeled objective results is a tabular recount of all interactions with key leaders. This result shows the official involved, and the reason for contact with him.

3.2 Value Focused Thinking

Our stability model is based mainly on MODA, which ranks alternatives to assist in selection of the preferred alternative. Specifically, it is useful in enhancing decision making for allocation of resources and solidifying support for a particular portfolio of projects. Our model will help to identify an appropriate mix of projects at this level, to maximize overall value.

It is important to first identify what is meant by the term “portfolio”. A portfolio or mix of post-conflict reconstruction projects may be viewed at two levels. An overall portfolio of projects for the post-conflict country exists at the upper level and is comprised of the lower level of individual agency portfolios of projects. This lower level is the mix of projects from each of the stakeholders involved in the post-conflict reconstruction effort. A representative sample of the agencies or stakeholders, with their own portfolio of

projects for a post-conflict country, includes the DoD, Nongovernmental Organizations, USAID, the World Bank, International Organizations, Commanders Emergency Response Program (CERP)¹⁰, etc.

The MODA process begins with the post-conflict reconstruction value hierarchy that was developed as previously discussed. The five core outcomes are broken down into central tasks, and the central tasks identified can be further broken down into evaluation criteria in the value hierarchy model. The evaluation criteria presented here are representative critical tasks that may be performed during reconstruction operations. Their scope is not meant to be specific, as the execution of each task is situationally dependent.

As the evaluation criteria are dependent upon the situation and type environment, they are not presently assigned local weights in the value hierarchy model. It is not predetermined which, if any, of these evaluation criteria will be a factor so they cannot be assigned “constant” local weights in the model. Appropriate evaluation criteria and local weights will need to be determined, based on current information, when applying the model. We used mainly the information presented in Chapter 3 to develop our functions used to assess projects.

Again, the value hierarchy above does not depict constant local weights for the sample evaluation measures because these measures may not always be appropriate for the situation and type of environment. In addition, some information may not be made available or does not currently exist, so this must also be taken into account when determining appropriate measures. In the example above, local agencies may not openly share information regarding productivity, or there may not be a method in place to measure the unemployment rate in a particular rural area. Appropriate evaluation measures and local weights will need to be determined, based on current information, when using the model.

Multi-objective value analysis (Kirkwood, 1997) uses an overall value function which combines the multiple evaluation measures into a single measure of the overall value of each evaluation alternative, or portfolio of projects. Thus, different mixes of projects in a portfolio may be compared to determine the appropriate mix for maximizing value. Multi-objective decision analysis (MODA) is useful for structuring the judgments used in assessing the value of projects that comprise a reconstruction portfolio in an organization with multiple and conflicting objectives. Multi-objective decision analysis methods are based upon structured objectives, evaluation measures, value functions, and weights.

Multi-objective decision or value analysis (Kirkwood, 1997 and Keeney and Raiffa, 1993) uses an overall value function which combines the multiple evaluation measures into a single measure of the overall value of each evaluation alternative. Multi-objective decision analysis is useful for structuring the judgments used in assessing the measures on instability. Multi-objective decision analysis methods are based upon structured objectives, evaluation measures, value functions, and weights.

The additive value function $V(a_i)$ has the form:

$$V(a_i) = \sum_{k=1}^m w_k v_k(a_i) \quad (3.1)$$

¹⁰ CERP was established to enable local commanders in Afghanistan and Iraq to respond with small-scale, humanitarian relief, and reconstruction projects and services that immediately assist the indigenous population and that the local population or government can sustain.

with

$$\sum_{k=1}^m w_k = 1$$

and $0 \leq v_k(a_i) \leq 10$ for all $k=1, \dots, m$

The quantity $v_k(a_i)$ is the assessed value of alternative a_i . The weights w_k presents the tradeoffs across the criteria. Decision makers maintain the flexibility to manipulate the function (both weights and value functions) to fit the current situation.

When using MODA a structured approach must be taken to develop the weights, objectives and functions. In this research we presented objectives and functions based upon the experience of the authors, a literature review, and input from some subject matter experts. We then surveyed a group with experience in reconstruction to develop the weights using the swing weight matrix approach for developing the weights as shown in Table 3.1. This provides a realistic model to demonstrate the utility of this approach. This top down approach provides a starting point for allocating resources. Ideally, stakeholders should be involved at all levels. A structured decision process involving funding agencies and local governments should be used to develop objectives and functions. One such methodology is Value Focused Thinking (Keeney, 1992). Note that function should always be quantifiable and measurable. Once these objectives have been developed, the task of assigning weights can begin. Again, some type of structured decision methodology should be used with stakeholders at all levels providing input. In general, there is often very little disagreement on the objectives, functions, and how to quantify the functions. However, when assigning the weights are when stakeholder interests are reflected. For example, one group of stakeholders might place a high value upon security. Whereas another group of stakeholders such as the local populous would place a higher weight on meeting basic needs. Stakeholder buy in is critical with all parties agreeing to the framework. Sensitivity analysis can play a key role here to show how varying the weights over different ranges can have little or major impact on the objective function.

Table 3.1 Elements of a swing weight matrix

		Importance of the value measure to the decision		
		High*	Medium	Low
Range of variation of the value measures	High	A	B ₂	C ₃
	Medium	B ₁	C ₂	D ₂
	Low	C ₁	D ₁	E

Weights in the following cells need to follow these relationships (Parnell et al, 2008):

- A > all other cells
- B1 > C1, C2, D1, D2, E
- B2 > C2, C3, D1, D2, E
- C1 > D1, E
- C2 > D1, D2, E
- C3 > D2, E
- D1 > E
- D2 > E

Table 3.2 contains the corresponding values we will use for this research.

Table 3.2 *Swing weight values*

		Importance of the Value Measure to the Decision Makers and Stakeholders		
		<i>High</i>	<i>Medium</i>	<i>Low</i>
Variation in Measure Ranges	<i>High</i>	100	70	40
	<i>Medium</i>	80	50	20
	<i>Low</i>	60	30	10



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Chapter 4

Demonstration Study

4.1 Introduction

In order to investigate the utility of our methodology we developed a simple spreadsheet implementation using the functions and objectives described in Section 4.3 and the methodology described in Chapter 3. The model contained herein is functional to demonstrate the methodology but certainly is in need of further development to include

- Validation of the weights and scoring schema,
- Visual basic programming to make the model more user friendly, and
- Being used in an actual problem to validate its utility and to develop recommendations for improvement.

4.2 Why Kenya

4.2.1 History of Kenya

Very similar to the United State's origins, immigrants created much of the early history of Kenya. Between 1500 and 1850AD many Bantu clans and families from eastern Uganda immigrated into Western Kenya and developed the base for the present-day Abaluyia, Aagusii, and Abakuria communities.¹¹ The ancestors of the Kikuyu (today's largest ethnic group in Kenya) moved from the northeast of Mount Kenya during the 16th century and split into many different groups that occupied the highlands of Kenya by the late nineteenth century.¹² The Kikuyu formed many symbiotic relations with neighboring tribes to improve their farming and hunting skills and thus formed relations with tribes such as the Athi, groups of which still survive within the Rift Valley province today.¹³ Ancestors of the Embu and Mbeere began the movement to Southern Kenya.

Arabs and Muslim traders created settlements on the coast dating from the thirteenth century. Arab traders and Persian merchants flocked to the Kenyan coast and created an extensive commercial network that connected East Africa and Southwest Asia. An interesting mix of the two cultures, Bantu speaking East Africans and Arabs, resulted in the development of the Swahili language that is the primary language of Kenya today. Vasco de Gama's arrival in Mombasa in 1498 marked the beginning of Kenya as a Portuguese colony until 1729.¹⁴ Most of the Arabs and East Africans living near Mombasa detested the Portuguese authority over the area and attempted many times to overthrow the Portuguese. The imam of Oman grew his influence throughout the Kenyan coast during the mid seventeenth century and eventually overthrew the Portuguese Fort Jesus and asserted its power over the region.¹⁵

As the imam's power rose over the region, the British entered the East African scene and made an agreement with Said (lord of the region) to restrict his involvement in the slave trade.¹⁶ While this may seem insignificant, it was just the beginning of British influence and dominance over the region. With this agreement, the British began to bring in their naval ships to secure the area and continued to impose treaties with Said that would limit trading to the certain coastal areas. Christianity also began movement into the region with the Swiss serving with the Anglican Church Missionary Society in 1846.¹⁷ Soon enough the privately owned Imperial British East Africa Company (IBEAC) was given a royal charter and

¹¹ William R. Ochieng' *Themes in Kenyan History* (Nairobi: Heinemann Kenya Limited, 1990), 4.

¹² Harold D. Nelson, *Kenya, A Country Study* (Washington D.C., 1984), 6-7.

¹³ *Ibid.*, 7.

¹⁴ U.S. Department of Defense, *Country Handbook: Kenya* (Washington D.C., 2000), 54.

¹⁵ Harold D. Nelson, *Kenya, A Country Study* (Washington D.C., 1984), 10.

¹⁶ *Ibid.*, 11.

¹⁷ *Ibid.*, 11.

substantiated British claims of land in Uganda as well as Kenya.¹⁸ From here, the IBEAC spread through Kenya and found habitable, fertile, and empty highlands that the British seized under the Crown.

The British in Kenya focused mostly on the development of an agricultural economy. In the fertile highlands, cash crops such as cotton, cashew nuts, wattle, tobacco, and coffee.¹⁹ Because of the booming agricultural growth within Kenya, lands became scarce and much of the local population could not purchase or use land for their needs. Political problems began to emerge as well with the East Africa Indian National Congress, which became the most influential political association within Kenya.²⁰ This Congress did not have a fair representation of the people it presided over. For example, its Legislative Council consisted of eleven Europeans, five Asians, one Arab, one missionary representative for Africans, and one representative for African interests.²¹ This unfair representation of Africans jumpstarted the roots of the African political protests and activities. The headmen and Chiefs of the Kikuyus formed together and opposed forced regulations of land and compulsory labor recruitment.²²

These key leaders of the Kikuyu then formed an association, the Kikuyu Central Association (KCA), in 1925 which became a prominent political group by the advent of World War II. The KCA took active steps to put out the message that the Kikuyu wanted fair representation of their population in Kenya. One of the initiatives they took included sending Jomo Kenyatta, who was the general secretary of the KCA, to present a petition to the British government demanding seats in the Legislative Council for a more fair representation of the people in Kenya. Unfortunately, the British banned the KCA in 1940 calling it a “wartime emergency measure.”²³ This ban didn’t do anything positive for the British. Instead, an even more militant and violent group arose from the KCA’s ashes, the Mau Mau.

The Mau Mau began their movement with civil disorder such as arson and cattle maiming.²⁴ Such actions spurred the movement of 15,000 insurgents to the forested Kenyan highlands which resulted in terrorist attacks and small skirmishes with the British security forces.²⁵ The settlers within Kenya called for a state of emergency and that led to the imprisonment and concentration of Kikuyu to essentially camps controlled by the British security forces. The violent protests and attacks that the Mau Mau continued to enact led to some positive outcomes such as land and agrarian reform that allowed natives to farm cash crops such as coffee.²⁶ The British soon restored the right of political organization within Kenya and even called for a conference that brought together African leaders to emphasize the need for unity.²⁷ Britain’s Colonial Secretary, Allan Lennox-Boyd, came to Kenya and led discussions with Kenya’s leaders to advance the constitution process of the country.²⁸

Kenyans now saw the road to independence and pushed for the eventual conclusion. Two major parties in Kenya emerged, the Kenya African National Union (KANU) led by Jomo Kenyatta and the Kenya African Democratic Union (KADU) led by Ronald Ngala. The Kikuyu and Luo supported the KANU and the rest of the minority tribes within Kenya supported the KADU. The main difference between the two parties also dealt with the type of government each wanted for Kenya. The KANU supported a unitary system of government while the KADU supported more of a regional government.²⁹ Eventually, the KANU led by the popularity of Jomo Kenyatta took control over the elections of 1963, and Kenya was finally granted independence and officially became a republic on 12 December 1963.³⁰

¹⁸ Ibid., 14.

¹⁹ William R. Ochieng’ Themes in Kenyan History (Nairobi: Heinemann Kenya Limited, 1990), 32.

²⁰ Harold D. Nelson, *Kenya, A Country Study* (Washington D.C., 1984), 23.

²¹ Ibid., 24.

²² Ibid., 26.

²³ Ibid., 27.

²⁴ Ibid., 29.

²⁵ Ibid., 29.

²⁶ Ibid., 31.

²⁷ Ibid., 32.

²⁸ William R. Ochieng’ Themes in Kenyan History (Nairobi: Heinemann Kenya Limited, 1990), 198.

²⁹ Ibid., 198.

³⁰ Ibid., 199.

4.2.2 Kenya Following Independence

After being granted the powers of a prime minister, Jomo Kenyatta focused on the unification of the country's tribes especially between the KANU and the KADU. In order to do this, he chose an ethnically diverse cabinet, but his effort to merge the KANU and the KADU failed.³¹ More unification problems arose from the northeastern region of Kenya known as Somaliland. Somali insurgents, known as shifta, threatened the security of the northeastern region as well as the Kenya highlands. After the Kenyan government began to confiscate milch camels and donkeys from the possession of the Somali, the shifta rose to violence because the milch camels were their measure of wealth and a man's pride within the community.³² Somalis also valued camels and donkeys because they are a nomad people and rely on these animals in order to look for water and pasture lands.³³ The Shifta's actions escalated throughout the 1960s, enacting terrorist attacks such as killing elders or any other form of authority. Many elders and authority figures would also be sent to Mau Mau courts to be sentenced to death and makeshift graves of dozens of bodies would be made.³⁴ In order to fight back against the Mau Mau insurgency, the British military commander in Kenya, General Erskine, devised "Operation Anvil" which targeted the entire Kikuyu population and arrested any Kikuyu suspected of aiding the Mau Mau.³⁵ This operation turned out to be highly successful as the Mau Mau suffered drastic losses in their leadership and scattered and destroyed most of the guerillas fighting out of the forested highlands. Essentially, this operation that spanned between 1954 through 1957 put an end to the Mau Mau's support groups and also destroyed its leadership foundations.

After Operation Anvil, many Kenyans understandably began to distrust the government questioning its leadership and its service to Kenyans. Thus much unrest filled up the years after the operation especially in the 1970s. Kariuki, who was a Mau Mau detainee, rose to be a prominent leader in opposition to the government and specifically its economic policy on foreign investments. During his time of rise, much of the violence within Kenya rose such as a bomb that exploded in Nairobi bus station and numerous cattle being maimed.³⁶ Even though Kariuki was in no connection to this rise of violence, the government's police, the old guard, accused him of the rise in violence. Kariuki then disappeared and later his body was found, mutilated. The Kariuki affair piled onto the suspicions and questions that Kenyans had against their own government. On August 22, 1978, Jomo Kenyatta died of natural causes and Daniel Toroitich arap Moi became president.

4.2.3 Post 1980 Kenya

Under Moi's leadership, Kenya officially became a one party state in June 1982 which was fiercely opposed. Kenya's economic recession of 1982 also led to an attempted air force coup.³⁷ Moi continued the government's fight against opposition groups, but he finally decided to introduce the multiparty system in December 1991 after harsh criticism from the international community.³⁸ In the elections of 1992, the KANU party almost lost majority control over the parliament as opposing parties won around 45 percent of the seats. The elections of 1997 led to an increase in the number of political parties from 11 to 26, but Moi won the re-election of 1997 as well. Following a fair and peaceful 2002 election, Moi finally stepped down from his presidency and Mwai Kibaki who is the leader of the National Rainbow Coalition (multiethnic opposition group to the KANU) became the president.

³¹ Harold D. Nelson, *Kenya, A Country Study* (Washington D.C., 1984), 35.

³² Nene Mburu, "Contemporary Banditry in the Horn of Africa: Causes, History and Political Implications," *Nordic Journal of African Studies* 8 (1999): 99.

³³ *Ibid.*, 99.

³⁴ David Anderson, *Histories of the Hanged: The Dirty War in Kenya and the End of Empire* (New York, 2005), 193.

³⁵ *Ibid.*, 200.

³⁶ Harold D. Nelson, *Kenya, A Country Study* (Washington D.C., 1984), 59.

³⁷ Department of Defense, *Country Handbook: Kenya* (Washington D.C., 2000), 56.

³⁸ *Ibid.*, 56.

4.2.4 Kenya's Current Economy Situation

Although Kenya's economy is considered one of the strongest within Eastern Africa, Kenya's economic performance throughout the years has not been the most impressive since the early 1970s. Kenya's economic performance between 1974 and 1983 declined due to inadequate credit, poor international trade terms, and susceptibility to world price fluctuations.³⁹ Much of the stoppage of international aid resulted due to Kenya's refusal to setting up barriers to protect against corruption as in IMF's refusal to continue funding Kenya's Enhanced Structural Adjustment program.

A shocking 50% of Kenya's population is below the poverty line mostly due to the fact of Kenya's high unemployment rate, measured at 40% in 2008. Despite much of its economic hardships, Kenya's GDP continues to grow at 1.7% a year.⁴⁰

The Human Development Index (HDI), a 1.0 measure rating based on the quality of health, education, and income within a country rated Kenya as a 0.47 which is the highest among the countries in the Horn of Africa (Ethiopia – 0.328; Sudan – 0.379; Uganda – 0.422; Djibouti – 0.402; Somalia and Eritrea had no ratings).⁴¹

4.2.5 Kenya's Regional/Ethnic Boundaries

Following Kenya's independence, the Regional Boundaries Commission created different regions of Kenya based on which tribe predominated a region and also created different regions in which tribes coexisted. Essentially, the commission drew out eight provinces and 41 different districts within these provinces.⁴² W.T.W Morgan also drew a map of Kenya that shows these ethnic boundaries which is shown in Figure 4.1.⁴³

³⁹ Ibid., 70.

⁴⁰ CIA the World Factbook, "Kenya," *CIA the World Factbook* (Washington D.C., 2011).

⁴¹ International Human Development Indicators, "Kenya, Ethiopia, Sudan, Uganda, Djibouti." United Nations Development Program. (2010). <http://hdrstats.undp.org/en/countries/profiles/KEN.html>

⁴² S. Forster-Sutton, C. S. Thornley, and M. Hyde-Clarke, Report of the Regional Boundaries Commission (London, 1962), Cmnd. 1899.

⁴³ Roddy Fox, "Bleak Future for Multi-Party Elections in Kenya," *The Journal of Modern African Studies* 34 (December 1996): 598.

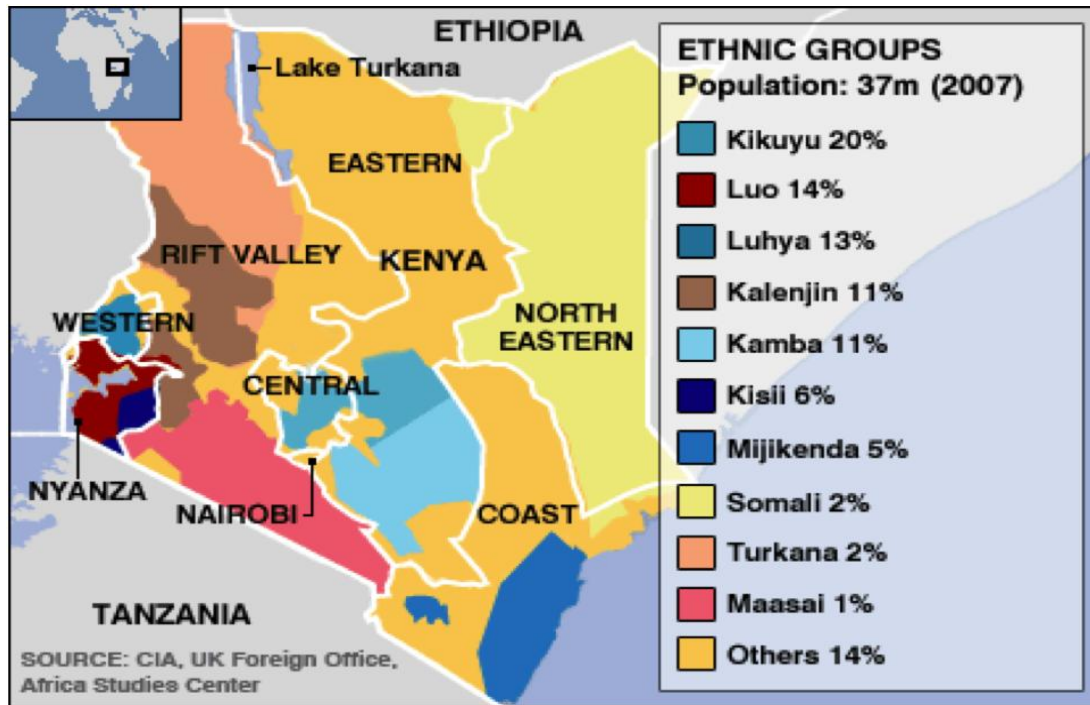


Figure 4.1 Kenya's ethnic group boundaries⁴⁴

Out of the ethnic groups, the Kikuyu has the most power within Africa for its members well represent the clan in public life, government, and business. The Luo people are known for its artists and traders while the Kamba are well presented in defense and law enforcement.

These ethnic groups present quite a challenge to us in that Kenyans do not really have a sense of national pride. Rather, Kenyans are more prideful of their tribe and those who do not belong in their tribe are oftentimes harrassed and sometimes even killed in mass during times of tension. An example of this was the disputed 2008 election of incumbent President Mwai Kibaki. The opposition party's candidate, Raila Odinga, accused President Kibaki of electoral fraud claiming that he was "robbed of victory."⁴⁵ Odinga's cry of fraud resulted in the death of 1,500 people and constant harrassment of the Kikuyu clan (Kibaki identifies himself as a Kikuyu) members.⁴⁶ This violent stretch of ethnic battles finally came to a close after an agreement between the two leaders on the formation of a coalition government which encompassed members of both ruling party and the opposition party.⁴⁷

⁴⁴ Roddy Fox, "Bleak Future for Multi-Party Elections in Kenya," *The Journal of Modern African Studies* 34 (December 1996): 598.

⁴⁵ BBC News, "Kenya Rivals Agree to Share Power," *BBC News*, February 28, 2009.

⁴⁶ Ibid., 1

⁴⁷ Ibid., 1

4.2.5 United States Interests within Kenya

Kenya is considered one of the more stable countries within sub Sahara Africa in terms of its economy and its governmental system. The U.S. continues to sell military equipment to Kenya through its Foreign Military Sales and Foreign Military Financing selling close to \$23.5 million in FY2005 and \$8.5 million in FY2006.⁴⁸ International Military Education and Training programs making sure that Kenya's military is self-sufficient in defending the country. This begs the question why the U.S. is pouring so much money into a relatively stable country. Al-Shabaab's presence along the Somalian and Kenyan border is one of the primary reasons for the U.S.'s concern for Kenya.

Kenya's porous border with Somalia is a big concern for the U.S. for the Somali terrorists, Al-Shabaab, have been known to cross into Kenya to hideout and train in its vast desolate Somaliland or even in the forested areas of the highlands. Recently, Kenya strengthened its borders with Somalia adding security officers to Liboi, a town known for having many members of Al-Shabaab passing through it.⁴⁹ It also warned Al-Shabaab that any violation of crossing the border will be met with violent resistance. The U.S. has also taken active steps in attempting to curb Al-Shabaab's presence within Kenya. In mid-September 2009, U.S. Special Forces killed Saleh Ali Nabhan, leader in Al-Shabaab, who was involved in the bombings of the U.S. embassy within Kenya.⁵⁰ The U.S. primary concern is to prevent Al-Shabaab from easily entering Kenya and using Kenya as a harbor for its training as well as further violent terrorist attacks within Kenya. Kenya's leadership is strongly against Al-Shabaab bringing violence into Kenya, but its ineffectiveness in the security over its borders has made it relatively easy for Al-Shabaab to continue violence across the Kenyan border.

As a traditional trading partner with the United States, there are many American citizens who travel and work in Kenya. Another reason why the United States is concerned with Kenya's security is the oil that Kenya imports, refines, and exports to the U.S. As a big trading partner, a significant number of U.S. citizens work and live temporarily in Kenya whose safety is another source of concern for the United States. Kenya also has a predominant population of Christians. 45% of the populations identify themselves as Protestant and another 33% as Roman Catholics.⁵¹ This is significant for it means that a significant number of missionaries and church leaders travel to Kenya every year and reside temporarily within Kenya working on missions and furthering Christianity throughout Kenya.

4.3 Value Focused Thinking

The value hierarchy is a pictorial representation of the value model. The fundamental objective is the most basic high-level objectives the stakeholders are trying to achieve. Our objective for the Kenya stability model is shown in Figure 4.2. Figure 4.3 shows along with our fundamental objective the associated functions. Our value measures are aligned with these functions.

⁴⁸ Michael Klare and Daniel Volman, "America, China, and the Scramble for Africa's Oil," *Review of African Political Economy* 33 (June 2006): 299.

⁴⁹ Christine Lagat and Daniel Ooko, "Kenya Warns Somalia Al-Shabaab Militia as Tension High at Border," *Hiraan Online: News and Information about Somalia*, April 01, 2011, http://www.hiiraan.com/news2/2011/apr/kenya_warns_somalia_al_shabaab_militia_as_tension_high_at_border.aspx.

⁵⁰ Mail & Guardian, "U.S. kills Al-Qaeda target in Somalia helicopter assault," *Mail & Guardian Online*, September 15, 2009, <http://www.mg.co.za/article/2009-09-15-us-killsalqaeda-target-in-somalia-helicopter-assault>.

⁵¹ CIA the World Factbook, "Kenya," Washington D.C., 2011, accessed at <https://www.cia.gov/library/publications/the-world-factbook/> November 23, 2011

Present a measure for the
possibility of Kenya
transitioning to a state of
instability (instability
index)

Figure 4.2 Fundamental objective for our Kenya stability model

The next level of the value hierarchy is the primary functions associated with the fundamental objective. Based upon the literature review presented in Chapter 2 we chose four functions as shown in Figure 4.3. They are the broad categories that must be addressed in order for us to solve the fundamental objective. They represent what must be done to accomplish the fundamental objective. Sub-functional and the corresponding value measure for each of these functions are shown in Figures 4.4 through 4.7.

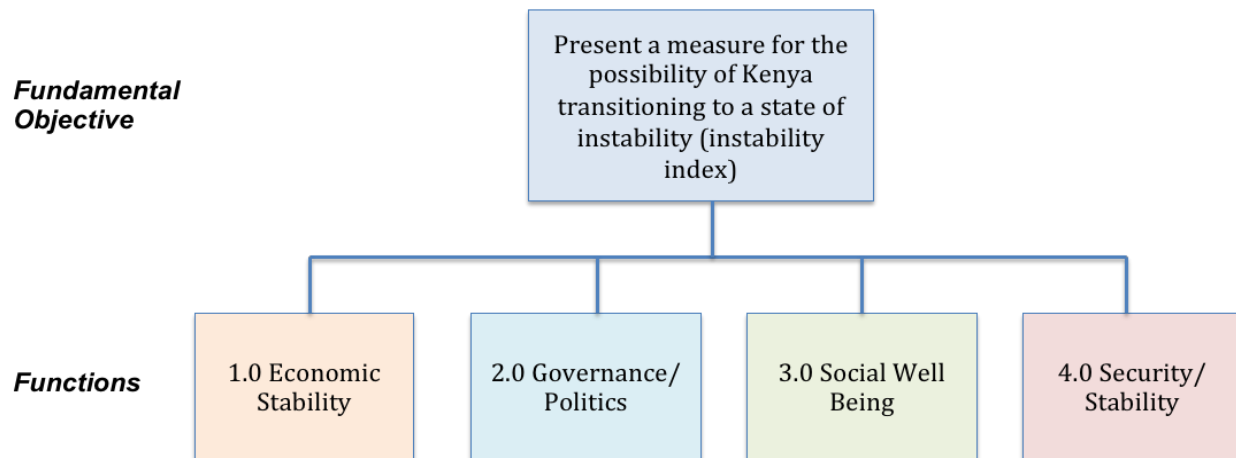


Figure 4.3 Value hierarchy model

Finally, we developed the objectives that support each one of these functions. Each objective is how we intend to quantify the value associated with each function.

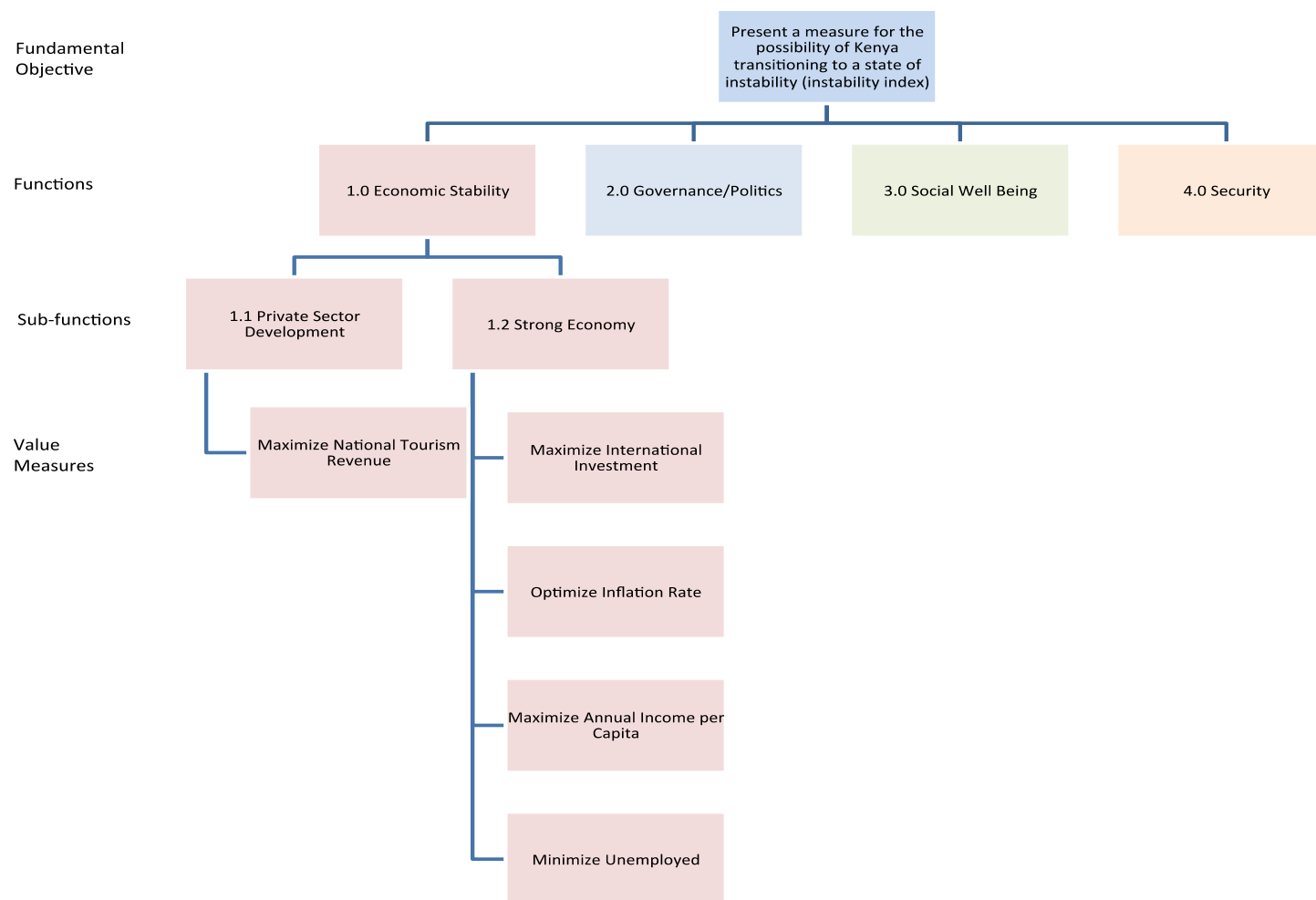


Figure 4.4 Value hierarchy model showing the value measures for the economic stability function

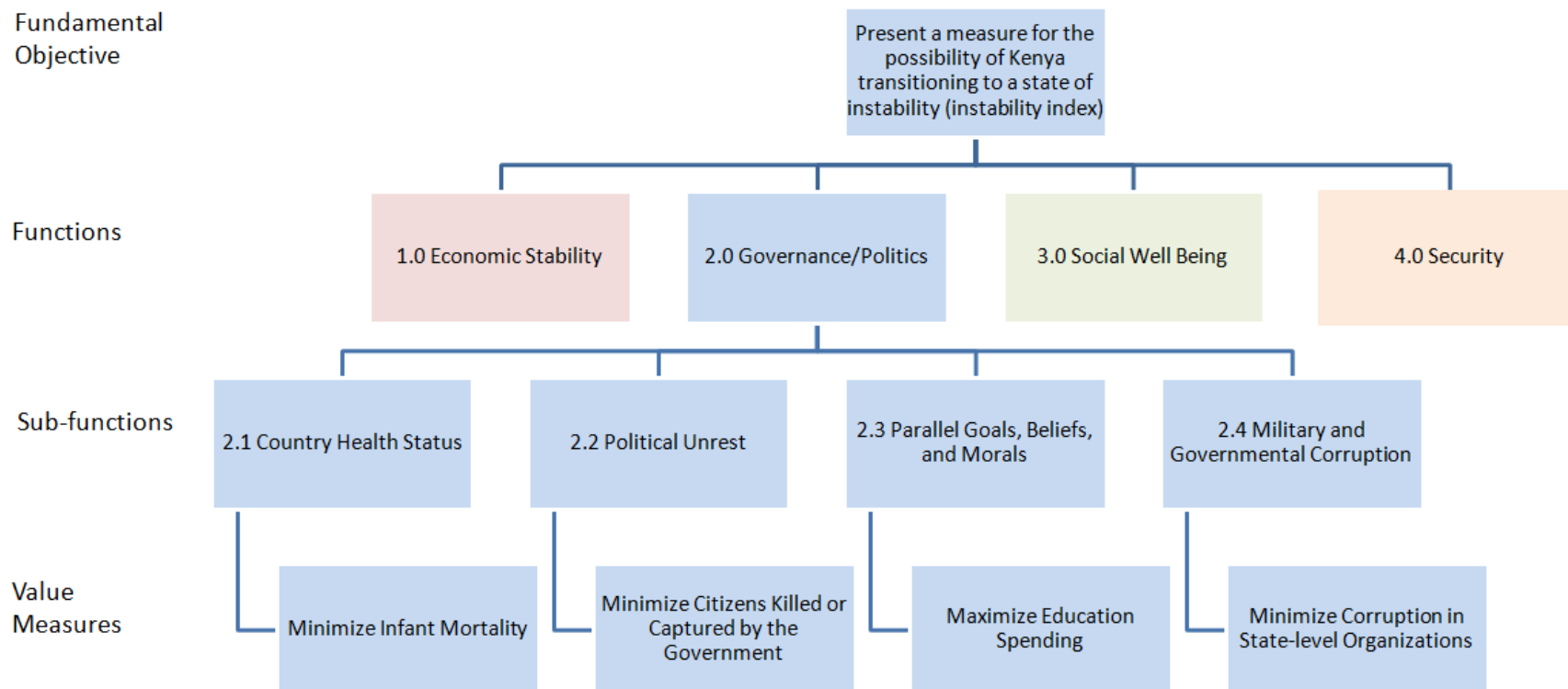


Figure 4.5 Value hierarchy model showing the value measures for the political unrest function

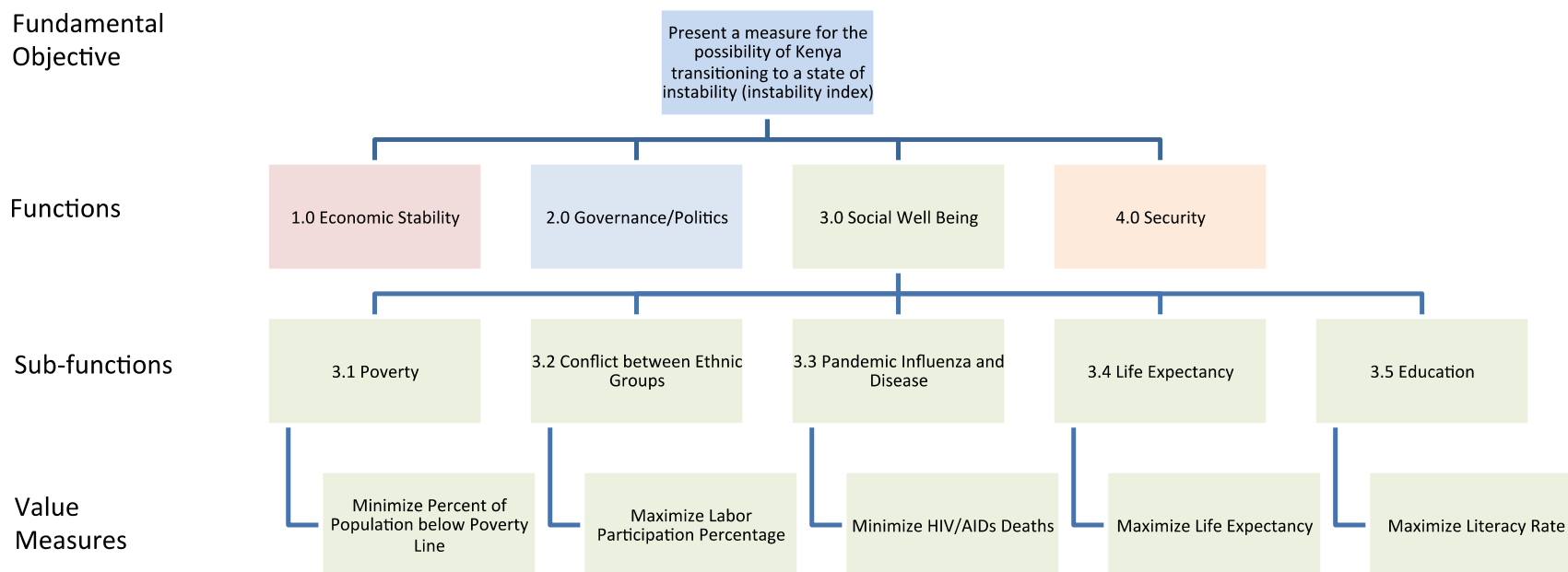


Figure 4.6 Value hierarchy model showing the value measures for the social well being function

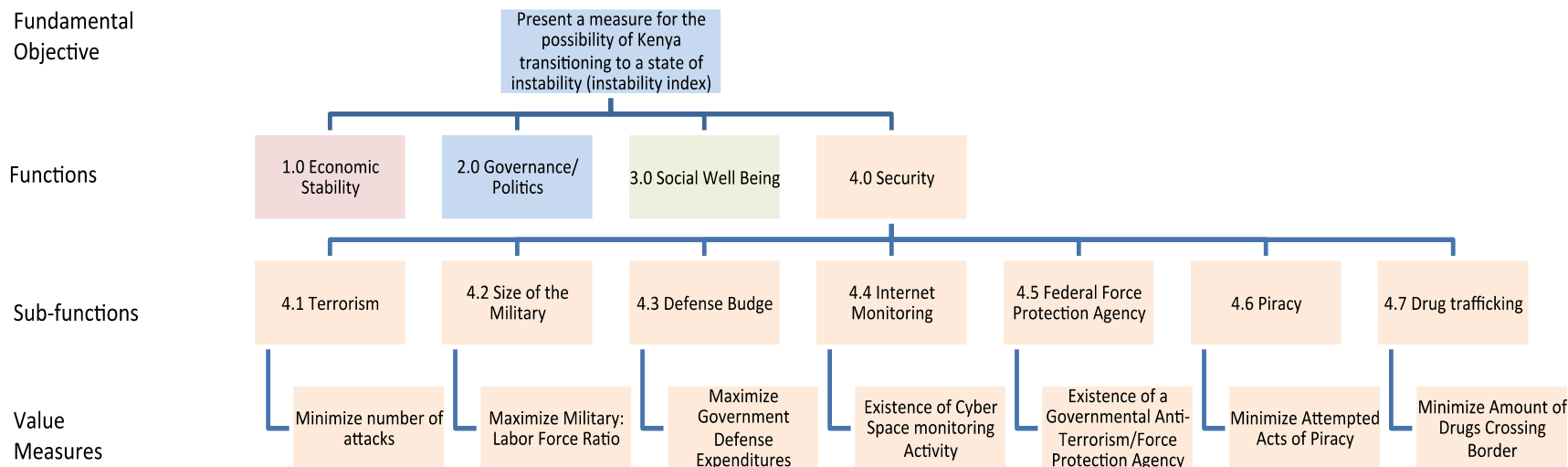


Figure 4.7 Value hierarchy model showing the value measures for the security/stability function

4.3.1 Economic Stability Function

4.3.1.1 Private Sector Development Sub-function

Maximize Dollars Generated from Tourism

Tourism is a significant contributor to Kenya's Gross Domestic Product (GDP). Tourism generated \$807 million in 2009 with over 1.1 million tourists visiting the country, an all-time high.⁵² For the same reason that GDP is an important factor in measuring both Kenya's economy's strength and Kenya's stability, the portion of the GDP that comes from tourism is almost equally important. As shown in Figure 4.8 the value's graphical representation is presented as a linear function. The function is centered on the 2012 Kenya statistic for the measure of about \$800m, which yields a value of 50. The upper and lower limits of the graph are plus/minus 20% from the median.

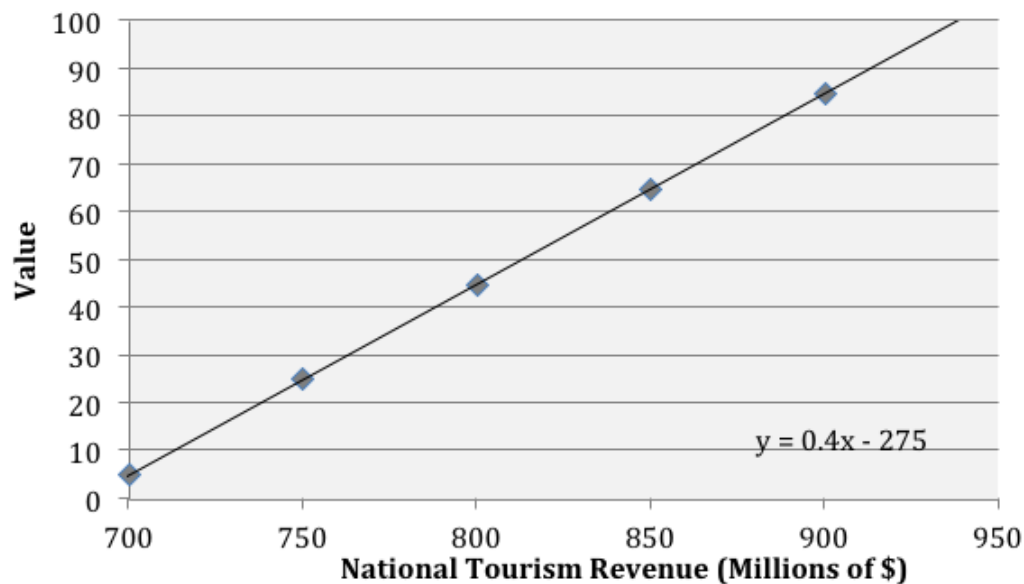


Figure 4.8 Value graph for national tourism revenue

⁵² Bureau of Africa Affairs, State Department. "Republic of Kenya," Washington D.C., 2011, accessed at <http://www.state.gov/r/pa/ei/bgn/2962.htm> 20 January 2012

4.3.1.2 Strong Economy Sub-function

Maximize International Investment

The amount of foreign money invested in a government is global sign of the strength of the nation economically. International investment will strengthen a nation's economy, government, and domestic business. When all of these things are improved a country's standard of living will improve which in turn leads to a positive change in the region's stability. As seen in Figure 4.9 the Value Function for this measure is a discrete bar graph based off the nation's ranking in investment climate for Africa. In 2010 Kenya was ranked 3rd in Africa for this.

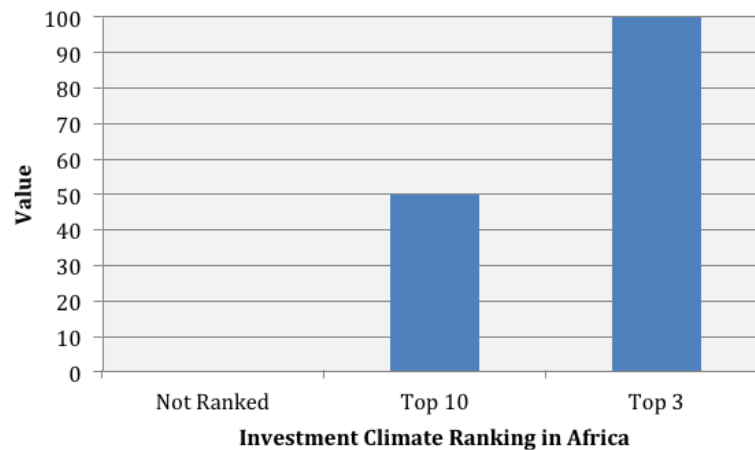


Figure 4.9 Value function for international investment in Kenya

Optimize Inflation Rate

Inflation Rate is a critical part of any nation's economy. It is typically calculated on an annual basis, and is used for almost all aspects of economics. It is vital to understand the value currency over time. Kenya's currency is the shilling. Generally, you would want a low inflation rate, because the higher it is the less valuable the nation's currency is and that come become rapidly developing issue. Economists have also realized that an inflation rate of zero is also not beneficial, and that you would to aim for an inflation rate just above 1%. Figure 4.10 shows the value function for this measure, with the 2012 statistic for Kenya at a value of 50.

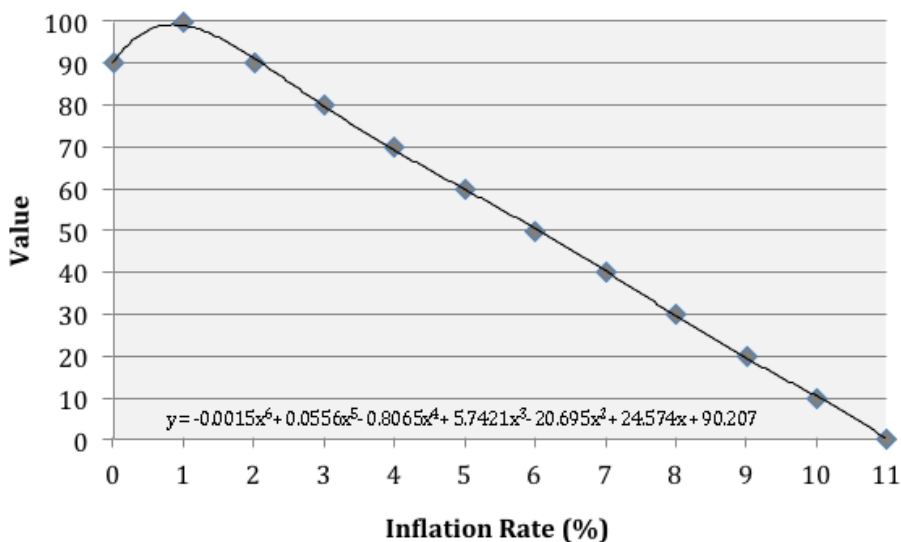


Figure 4.10 Value function graph and recent data for inflation rate

Maximize Annual Income per Capita

Annual Average Income can be used as an indicator of a nation's standard of living. Because of this value's tie to the strength of Kenya's economy and a possible meter of poverty and instability, for example in overly impoverished regions. Like the other value measures that fall under the economical categorization Annual Average Income is very straightforward and its value measure is mostly linear. The graph is centered, for the most part, around the statistic from the year 2010, when Kenya's Annual Average Income was the equivalent of \$730U.S.. The value function for this measure can be seen in Figure 4.11, the 2010 statistic has a value of 50.

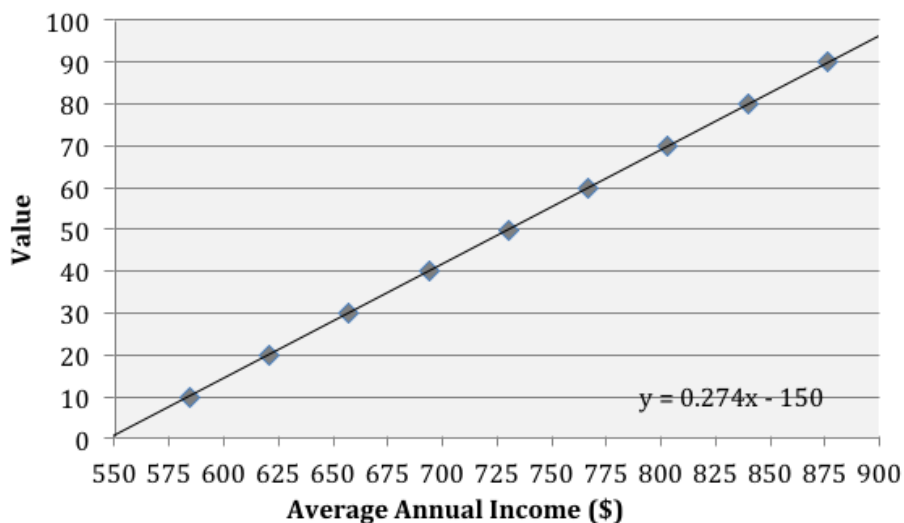


Figure 4.11 Value graph for annual average income

Minimize Unemployed

The percent of the population unemployed is a very important statistic to the strength of the economy. It is a reflection of the workforce and a representation of the lack of money that goes to the population. Coupled with annual average income, another economy value measure, this statistic can be a useful measure of instability. Percent of the population unemployed can help give a geographic look at where the particularly impoverished regions of the nation are when examined across the country. A lower percent unemployed is obviously better; the 2010 statistic for Kenya had percent unemployed listed a 40%, which has a value of 50 in the Value Graph shown in Figure 4.12.⁵³ The highest unemployment rate in Africa is from Mozambique and is 60%. This is why the value function spans from 0 to 60%.

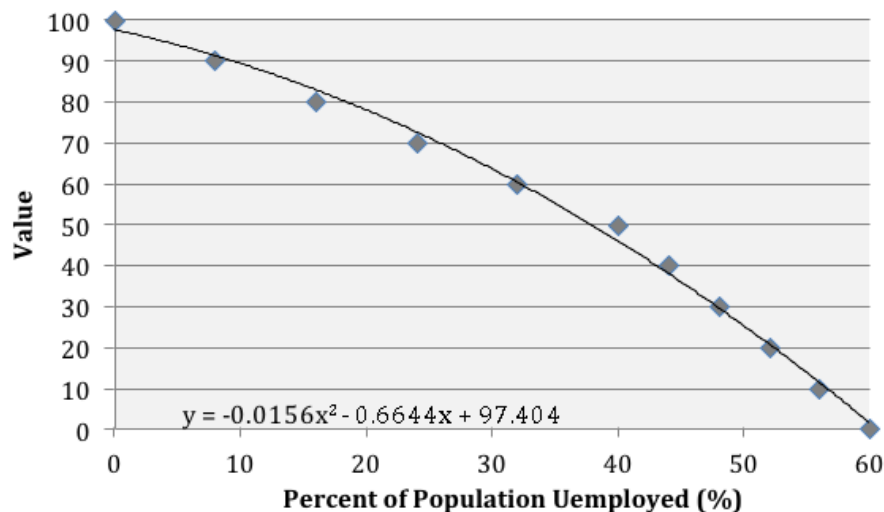


Figure 4.12 Value function for unemployment

4.3.2 Governance Political Function

4.3.2.1 Country and Regional Health Status Scoring Sub-function

Minimize Infant Mortality Rate

Traditionally under a social category, scoring a country's ability to provide healthcare and produce ways and means to care for its citizens is critical for maintaining rule of law and working towards a stronger future. An important indicator of the quality of health services is the infant mortality rate. This indicator not only shows the health of the mother (adult population) in being able to have a health pregnancy but it also demonstrates the ability of the society to care for its newest members. For this information we can collect yearly updates from the World Bank where we would be hoping to see the infant mortality rate decreasing over time to indicate an increase in the effectiveness and availability of health services.

Consequently, we have generated a value function for the quality of production for healthcare. The data represents the number of infant deaths (children under 5 years of age) per 1,000 infants.⁵⁴ Figure 4.13 below depicts the data and its correlating value to be considered in the overall instability rating.

⁵³ CIA the World Factbook, "Kenya," Washington D.C., 2011, accessed at <https://www.cia.gov/library/publications/the-world-factbook/> November, 2011

⁵⁴The World Bank, "Mortality Rate," accessed at <http://data.worldbank.org/indicator/SH.DYN.MORT> November 2011

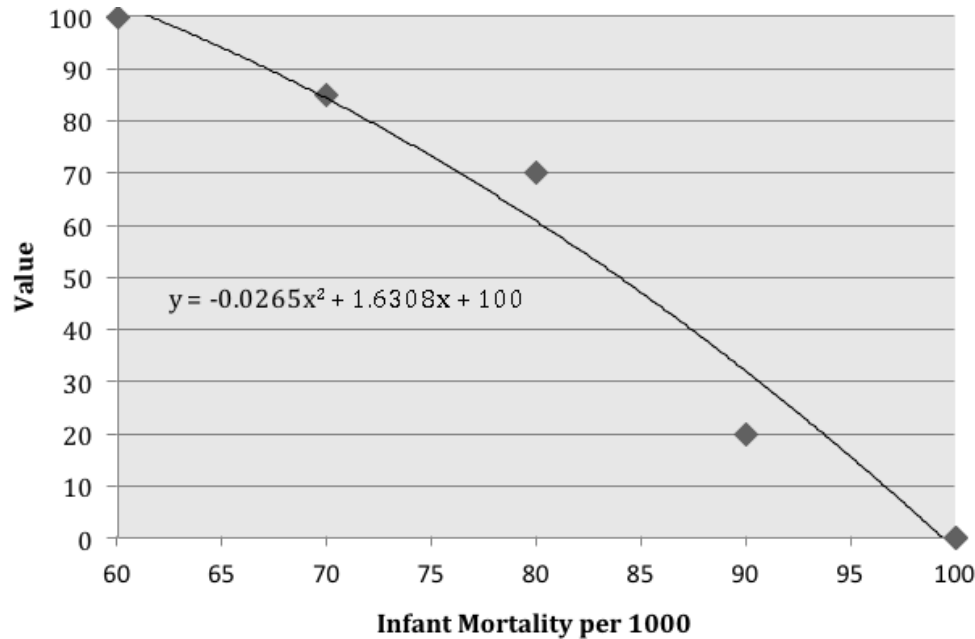


Figure 4.13 Health score value function

4.3.2.2 Political Unrest Sub-function

Minimizing Citizens Killed or Captured by the Government

Kenya is a culturally rich and diverse nation that prides itself on many different viewpoints and regional traditions. This dynamic creates an environment ripe for political upheaval. In an effort to quantify and analyze conflict we are looking to minimize what we call unrest by assessing the number of people captured and/or killed by the government. More simply, this metric will allow us to identify areas that may be more prone to political unrest so that we can see how the government will react to counter a rise in instability. For instance, by pulling data on the historical values we can cross reference them with significant political events and government actions to see if there are patterns or correlations. Based on the data for all of Kenya in the annual reports produced on amnesty issues we can compare the value measure across the timeline to possibly substantiate future governmental actions⁵⁵

Figure 4.14 below displays this scoring aggregate and how the values are inversely proportional to the maximum score received by a region.

⁵⁵ Amnesty International, "Annual Report: Kenya 2010," May 2010, accessed at <http://www.amnestyusa.org/research/reports/annual-report-kenya-2010?page=show> December 2011

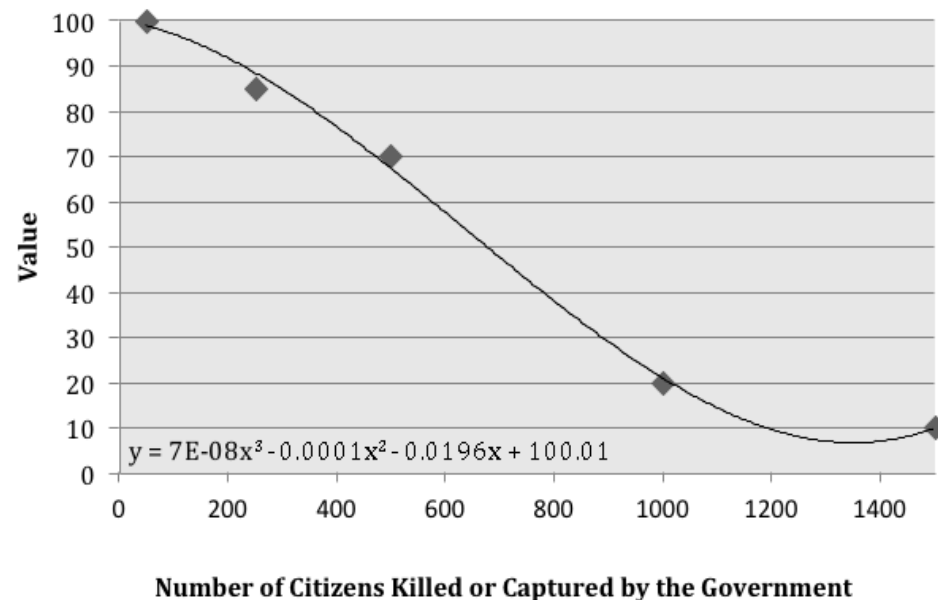


Figure 4.14 Political unrest value function

4.3.2.3 Bipartisan Cooperation and Productivity Sub-function

Maximize Educational Spending

At its most basic form, the function of the Kenyan government is to provide for its people. While we have already addressed the executive portion under rule of law and protection we have yet to discuss the political implications of a governments actions. Kenya is in a region with intense viewpoints and passionate citizens that leaves a large crevice with which to bridge in order to reach a political agreement. In an effort to capture the current and forecast the future for increased cooperation between differing political stakeholders we have analyzed government productivity. More specifically, if we measure the amount of public spending on education we can get a feel for its political identity with regards to goals, beliefs and morals. Therefore we have been able to access the political records for these values that represent a common understanding of how to prepare future generations to rule the country.⁵⁶

In the value function depicted below we translate a number of joint legislative actions to a value. The higher the value the more stable the nation is from a political perspective. While this model in Figure 4.15 does not account for other areas of governmental spending that is also a result of parallel viewpoints it does present the data as a percentage of total spending which does provide some insight into these other areas. We suspect to see an increase in the percentage of the total spending allocated to education as the country's GDP increases and its infrastructure becomes more modernized.

⁵⁶The World Bank, "Public Spending on Education," accessed at <http://data.worldbank.org/indicator/SE.XPD.TOTL.GB.ZS> December 2011.

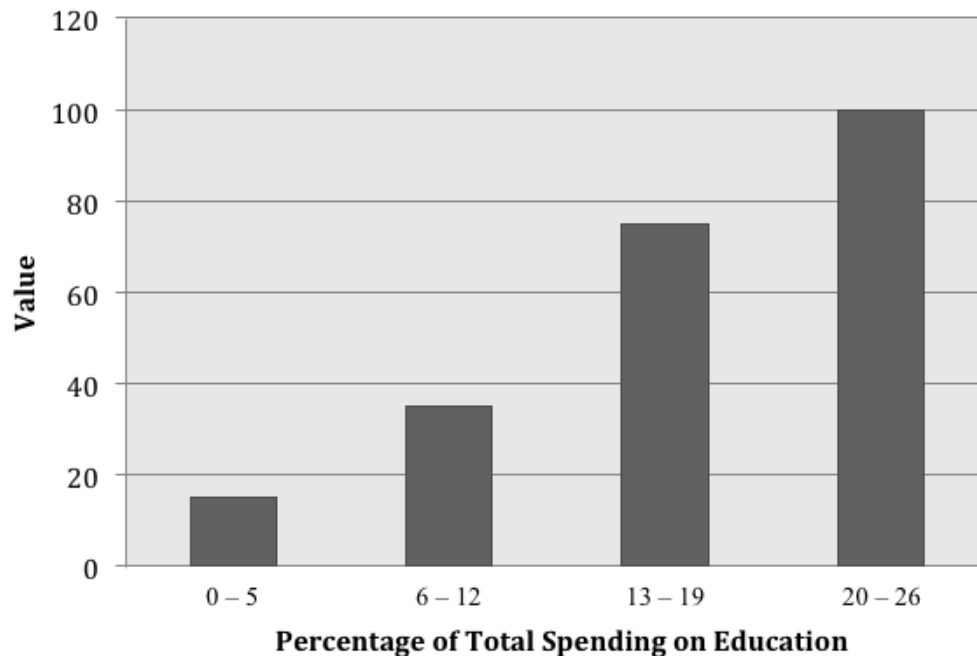


Figure 4.15 *Governmental action value function*

4.3.2.4 Military and Governmental Corruption Sub-function

Minimize Corruption in State-Level Organizations

In the analysis previously presented, we have addressed the concerns surrounding peace operations, governmental actions, and infrastructure development to provide health services. However, we have failed to look at a factor that has the potential to negate all other factors, the corruption index. If the governing body is corrupt the entire political system is infected with an unfaithful body incapable of acting on behalf of the needs and wants of the people. In Kenya, like most developing nations corruption has historically been very common. As we look to the future stability of Kenya, it is critical to monitor and react to the corruption indices posted by organizations such as the Transparency International.⁵⁷ It is not realistic nor efficient to try and retrieve this data on a regional level given the intricacies of the smaller cities, towns and villages yet the national corruption index can and will provide insight into the regions where the corruption levels may be highest. From there it would be possible to deploy Civil Affairs teams and data collectors to those regions to do a more in depth analysis.

For the value function we have simply correlated the number of data sources that the index accounted for, and the change in the historical values to a single value. For example if the number of data sources is greater than 5 we accepted the index number and was then able to filter insignificant or “bad” indices values. Figure 4.16 below depicts the correlated value based on the acceptable index numbers.

⁵⁷ Transparency International, “East African Bribery Index,” accessed at http://www.transparency.org/news_room/latest_news/press_releases_nc/2009/2009_07_02_kenya_index December 2011.

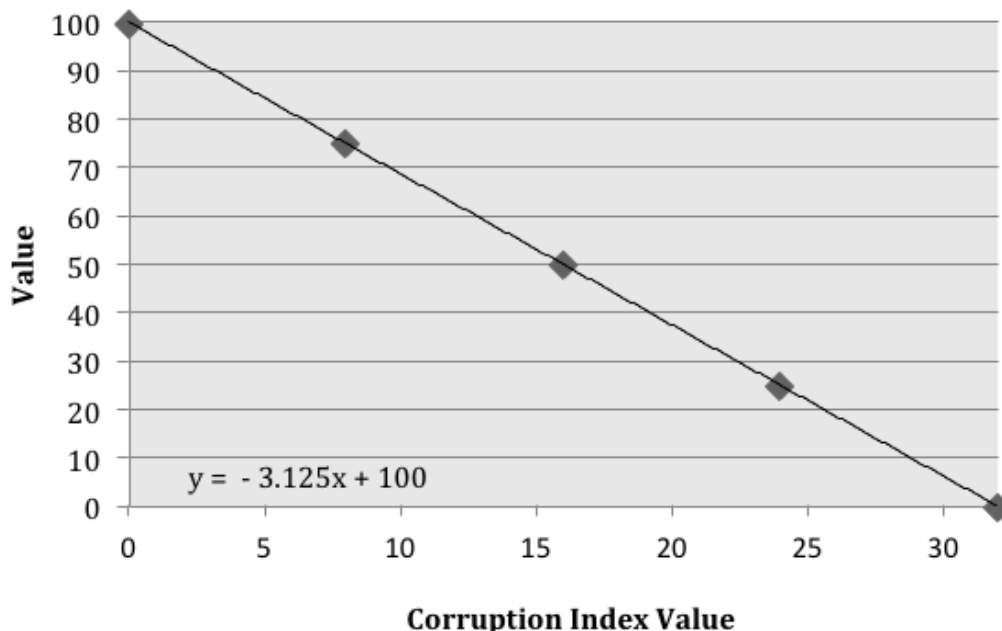


Figure 4.16 Military and governmental corruption value function

4.3.3 Social Well Being Sub-function

4.3.3.1 Poverty

Minimize Percentage of the Population Below the Poverty Line

The percentage of population below poverty line is an important metric because it gives us a snapshot of how poor a country is and how much its people are suffering from hardship. Many times hunger not only leads a nation's people to disease and pain but also to dissent and unrest against the government. Generally speaking, more people below the poverty line leads to more people dying and suffering from hunger. More people below the poverty line also means that there will be a high rate of dissatisfaction among the people on the nation's policy makers and politicians. So, we determined that a lower percentage of the population below the poverty line is better for the value of our model.

Figure 4.17 represents the value function for the percentage of population below poverty line. According to the CIA fact book, as of the year 2000, 50% of Kenya's population was below the poverty line.⁵⁸ Looking at the figure, we see that as the percentage of people below the poverty line increases the value decreases. This makes sense because more people who are below the poverty line logically indicates an increase in poverty which is the opposite of what we want.

⁵⁸ CIA the World Factbook, "Kenya," Washington D.C., 2011, accessed at <https://www.cia.gov/library/publications/the-world-factbook/> November, 2011.

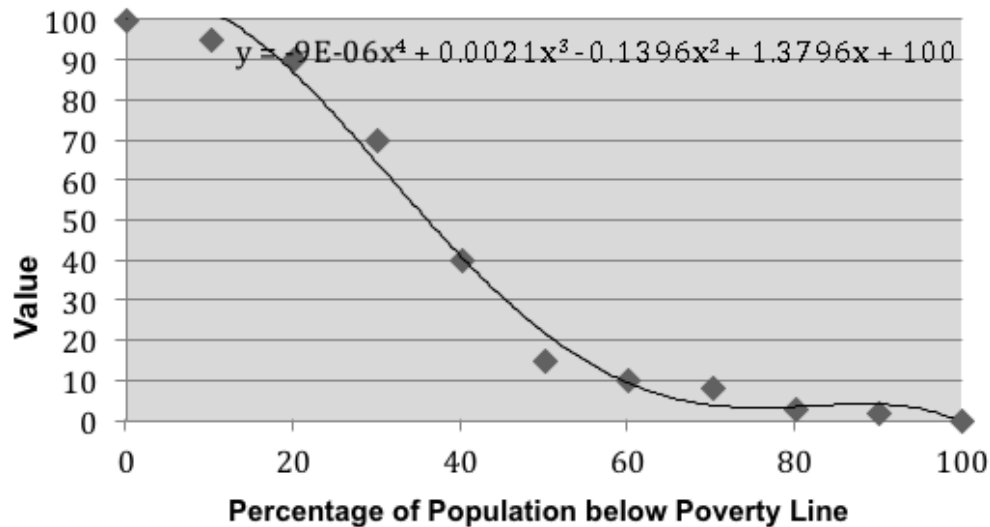


Figure 4.17 Graphical value measure representation for percentage of population below poverty line

Minimize Labor Participation Percentage

A significant number of cultural conflicts occurring per year indicate that the people of a nation are not very happy with each other or with how the government and its policies are being run. Clearly, this also reveals the instability of the nation as a whole that may continue to erode if immediate and long term controls are not set by the government. Cultural conflicts have been happening throughout Kenya, most recently building up to a crisis during 2007-2008.⁵⁹ Other conflicts in the past such as the Mau insurgency of the 1960s have also been a big contributor to the various tribal conflicts that still occur today.⁶⁰

The best way to quantify conflict between ethnic groups would be to count police reports or any other governmental reports that document the numbers of cultural conflicts that occur during the year. However since this information is not available, the labor participation rate (% of population 15 years of age and older) would be the best measure in minimizing conflict between ethnic groups. This is simply because if there are more people involved in the labor force, people generally have less time to argue over social disputes over ethnic differences. Rather more people of different ethnic groups would be forced to come together to work together for a company in order to earn money. Thus, with a greater labor participation rate, more people will put aside their ethnic differences in order to achieve earning a living for themselves and their families.

⁵⁹ Edwin Okong'o, "Kenya: Playing the Tribe Card," *Frontline World* (January 2008): 1.

⁶⁰ David Anderson, *Histories of the Hanged: The Dirty War in Kenya and the End of Empire* (New York, 2005), 193.

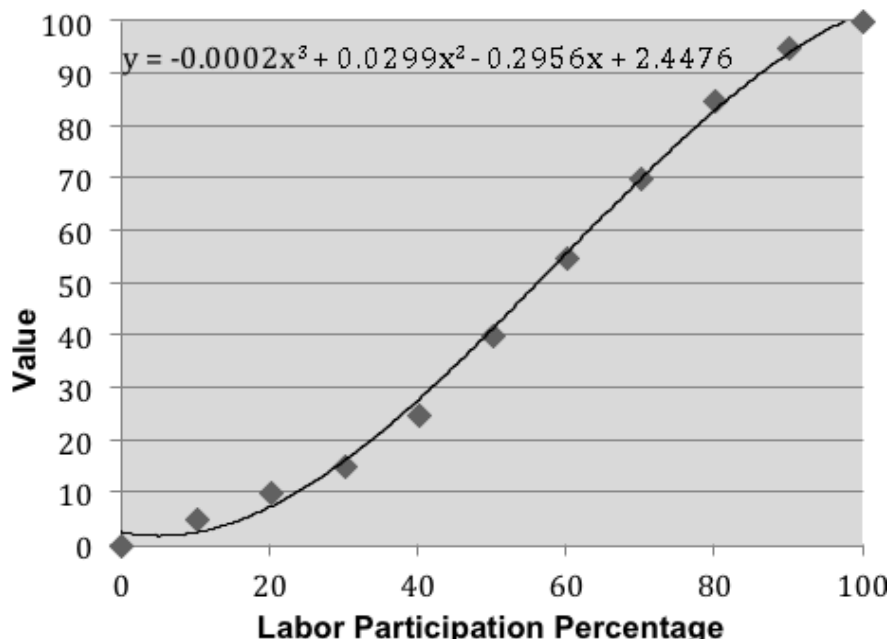


Figure 4.18 Graphical value measure representation for labor participation rate

4.3.3.3 Pandemic Influenza and Disease Sub-function

Minimize AIDS Deaths

AIDS continues to kill many people around the world today. According to the official U.S. government website, AIDS.gov, HIV (Human Immunodeficiency Disease) attacks the human immune system and at only an advanced state of infection is the body considered to have AIDS (Acquired Immunodeficiency Syndrome).⁶¹ Within Africa, it is estimated that fewer than half of HIV/AIDS patients within Africa are getting treatment for the disease.⁶² Currently, an uncontrollable number of people with AIDS are dying within Kenya. As of 2009, it is estimated that there have been 80,000 deaths all related to HIV/AIDS.⁶³

Figure 4.19 displays that as the number of HIV/AIDS related deaths per year increases the value goes down. This trend makes logical sense for an increase in deaths due to HIV/AIDS indicates that the government is not taking action to prevent such a prevalent disease. With government inaction on the health and well being of their people comes dissent and instability within a country. To reiterate, we want to minimize pandemic influenza and disease and not increase it.

⁶¹ AIDS.gov, "Pulmonary Tuberculosis," *A.D.A.M. Medical Encyclopedia*, 07 December 2010, <http://aids.gov/hiv-aids-basics/hiv-aids-101/overview/what-is-hiv-aids/>.

⁶² NPR, "In Africa, Bringing AIDS Treatment Closer to Home," *NPR Weekend Edition Sunday*, 26 July 2009, <http://www.npr.org/templates/story/story.php?storyId=10701789>.

⁶³ CIA the World Factbook, "Kenya," Washington D.C., 2011, accessed at <https://www.cia.gov/library/publications/the-world-factbook/> November, 2011.

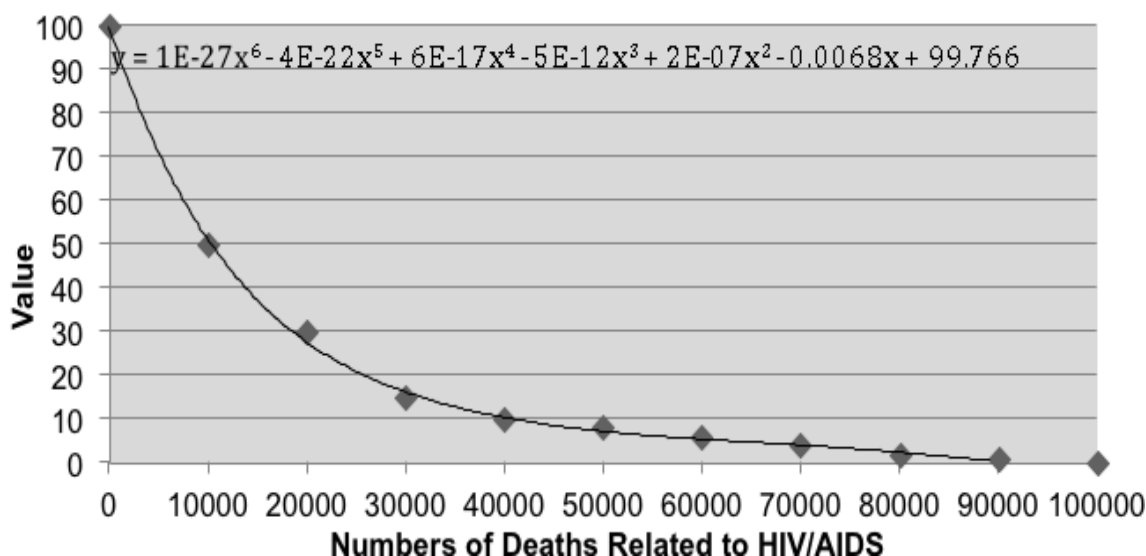


Figure 4.19 Graphical value measure representation of number of AIDS deaths

4.3.3.4 Life Expectancy Sub-function

Maximize Life Expectancy

Throughout the ages, life expectancy has been a key factor to how people make important life decisions such as going to college, getting married, having kids, starting a retirement fund, etc. Generally speaking, people would like to live longer simply because some want to be old enough to be able to see their grandchildren and some simply just want to accomplish more in life. Longer lives also mean that people are generally healthier and maintaining a high standard of living. People living longer also is a testament to the health system in place within a country for only a country with a reliable medical system can maintain the lives of the elderly as well as taking care of the sick. Therefore, it is logical to say that countries with a higher life expectancy generally are more stable due to the high quality of health systems, affordable access to high quality foods, and reliable government programs to ensure the betterment of health for its citizens. As of 2011 the life expectancy for Kenyans is 59.48 years.⁶⁴

Taking a look at Figure 4.20, we see that as the Kenyan life expectancy increases, the value increases. This makes sense because an increase in life expectancy is a direct contributor to our objective of maximizing life expectancy of Kenyans.

⁶⁴ CIA the World Factbook, "Kenya," Washington D.C., 2011, accessed at <https://www.cia.gov/library/publications/the-world-factbook/> November, 2011.

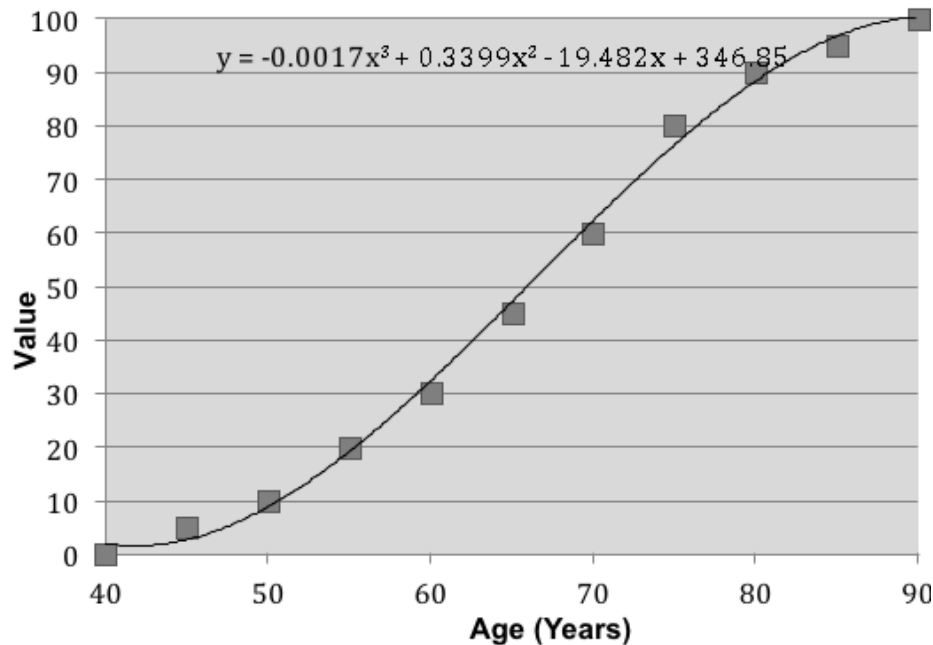


Figure 4.20 Graphical value measure representation of the life expectancy of the Kenyan population

4.3.3.5 Kenyan Education Sub-function

Maximize Literacy Rate

A high literacy rate is the fundamental base for any sort of higher education to be possible. Literacy will allow people to read and comprehend books and also allow for higher-level thinking and discussions to take place. Literacy can open people to learn valuable skills such as building structures or curing other people. Thus, a higher rate of literacy equates to growth in education which definitely contributes to stability and social well being of the Kenyan people. The CIA fact book defines the term literacy as people who are over the age of 15 and can read and write. As of 2003, 85.1% of Kenya's population is technically literate.

From Figure 4.21, we see that as the percentage of Kenyans who are literate increases as the value increases. This trend is logical for increasing the percentage of Kenyans who are literate positively affects our objective of maximizing Kenyan education.

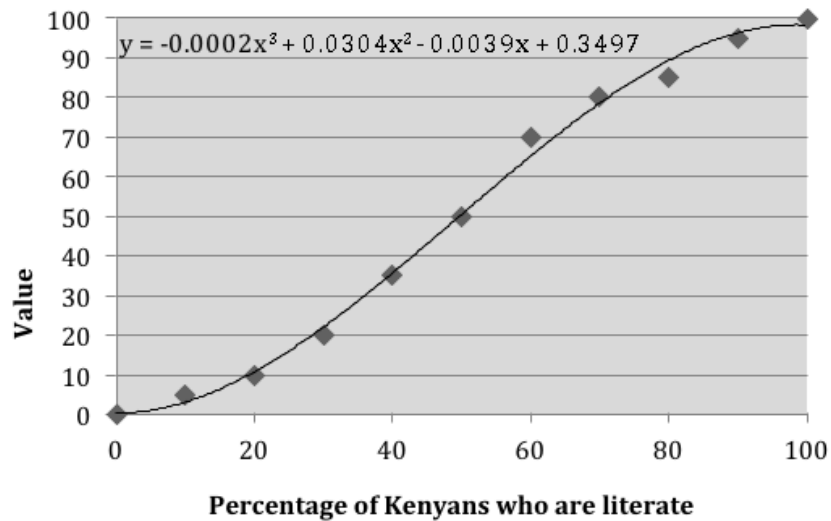


Figure 4.21 Graphical value measure representation of the literacy rate of the Kenyan population

4.3.4 Security Stability Function

4.3.4.1 Terrorism Sub-function

Minimize Number of Attacks

Terrorist attacks are inevitable. The important issue is what a country does to prevent them. A more stable government will have a measure in place that will decrease the amount of terrorist attacks. These measures include but are not limited to a national and local police force, a military, an anti-terrorism organizations, etc. This values measure indicates the number of terrorist attacks per month. The closer to zero attacks per month the better it is. This data could be obtained by CJTF-HOA.

Figure 4.22 is a graphical representation of value function for terrorist attacks. The units are terrorist attacks per month. The scoring for this value measure is negatively correlated with the number of attacks, as attacks increase the score decreases. If there are zero terrorist attacks in a giving month, the value measure will receive a value of 100, with 100 being the best and 0 being the worst. If the country has more than 3 attacks a month they will be given a score of 0.

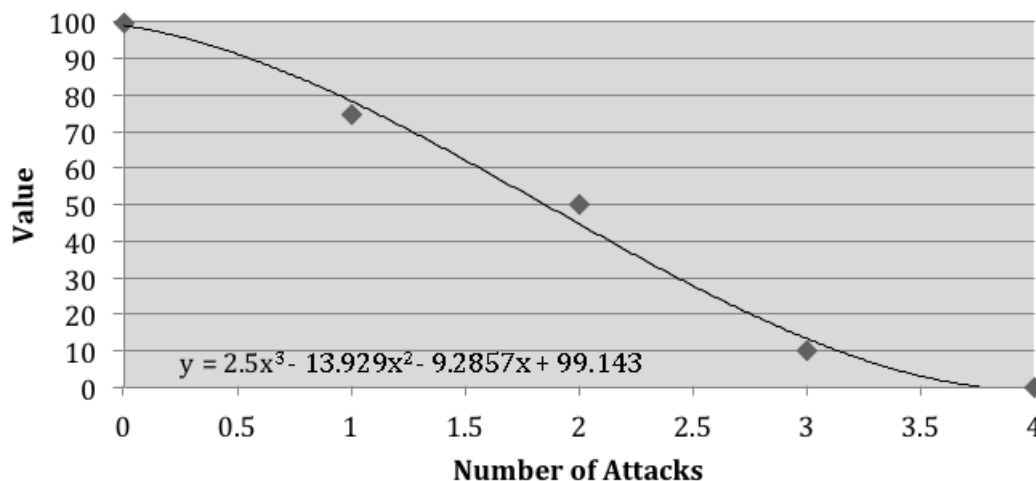


Figure 4.22 Value measure for the number of attacks per month

4.3.4.2 Size of Military Sub-function

Maximize the Ratio of Military to Labor Force Employees

A strong stable military is a must for any state. The bigger the military, the better the chance a state has to protect itself from attack. The size of the military is important for security reasons. To account for the size of the population and how that affects the size of the military, this value measure will score the ratio of members in the military to members in the work force. The scoring can be seen in figure in Figure 4.23.⁶⁵ As previously stated, the bigger the better. The value measure's score increases as the number of people in the military to work force ratio increases. If the country's ratio is less than .5% their score will be 0 and if its 3% or higher than they would receive a 100.

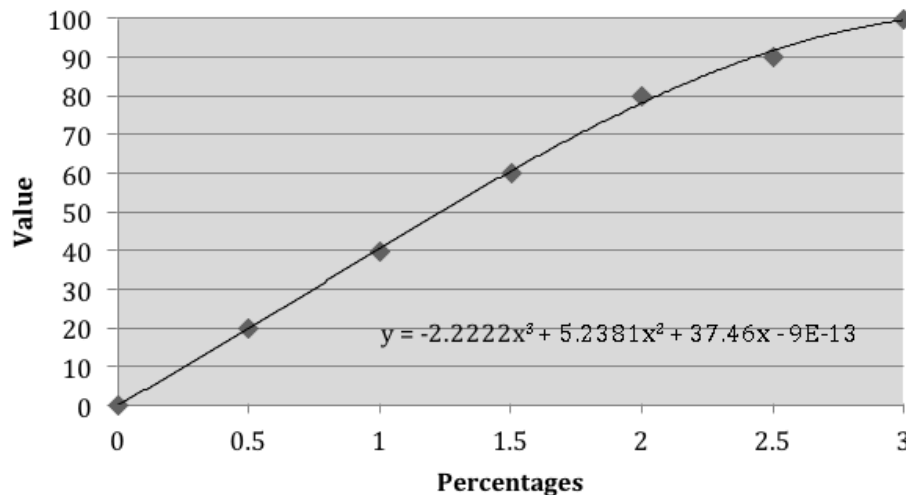


Figure 4.23 Value function for members in the military to members in the work force ratio.

4.3.4.3 Size of the Defense Budget Sub-function

Maximize Government Defense Expenditures

Without monetary resources a state governed agency cannot operate. The more money an organization receives, the better it is theoretically. They can buy better equipment, hire more workers, bring in outside knowledge, etc. To take into account the size of the countries expenditures, this value measure will measure the percentage the government spends on its military in comparison to the rest of its expenditures. Larger countries can spend more on their budget, just because they have the funds to do so. The data will be compiled from CIA Fact book and the Kenyan government budget office.

The more a country spends on their military in relations to its total expenditures the higher a score they will receive. Obviously if a country does not have a military or does not spend money on the military they will receive a value. In order to receive the highest possible score they would have to spend 10% of its GDP on their military. Any percentage in between would result in a score between 0 and 100.

⁶⁵ The World Bank, "Members in the Military to Members in the Work Force Ratio," accessed at http://search.worldbank.org/quickview?name=Armed+forces+personnel+%28%25+of+total+labor+%3Cem%3Eforce%3C%2Fem%3E%29&id=MS.MIL.TOTL.T.F.ZS&type=Indicators&cube_no=2&qterm=members+in+military+to+work+force December 2011.

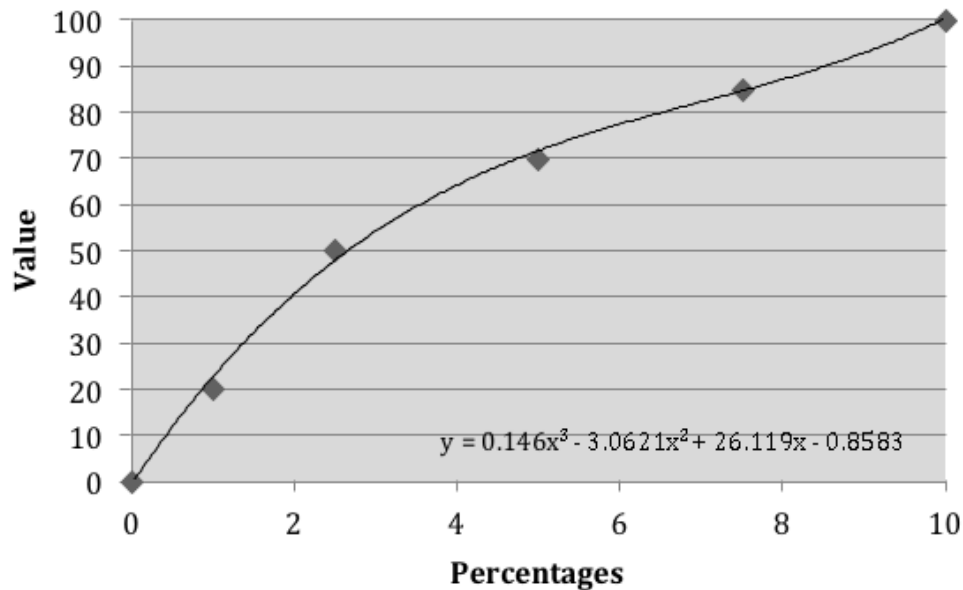


Figure 4.24 Value measure for the defense budget

4.3.4.4 Internet Monitoring Sub-function

Maximize the Monitoring Cyber Space Activity

Terrorist use the Internet just like the average person does. They have their own websites, they have their own blogs, and in some case they even have their own language. They have lines of communication through the Internet that need to be monitored as if they were phones in order to detect future attacks or whereabouts of high-risk individuals. This value measure will determine if there is a government agency that has oversight of what is on the Internet or can scan the Internet to detect potential threats.

This value measure is in its infancy so it would not be fair to rate how effective it is. A state will get the maximum amount of points, 100, if they have a state ran organization that monitors the internet and a 0 if they do not.

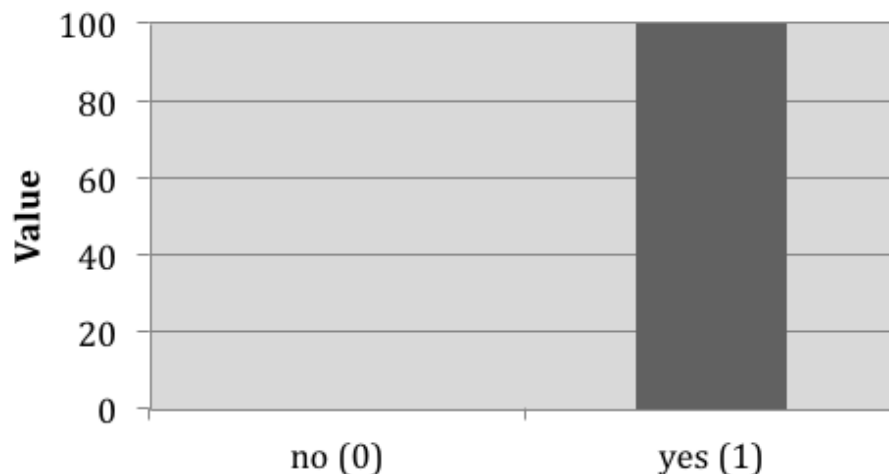


Figure 4.25 Value measure for the amount of Internet access

4.3.4.5 Federal Force Protection Agency Sub-function

Existence of a Government Anti-Terrorism/Force Protection Agency

Like a military, a state needs an anti-terrorism/force protection agency (i.e.: Federal Bureau of Investigation and National Security Agency for the United States). This agency has to monitor attack and crimes above the local level and the national level. The agency(s) will be in charge of investigating and monitoring crimes that are domestic and continue to monitor the borders.

Like the cyber space agency value measure, this measure will see if there is a government agency that solely combats national crimes that happen domestically and be scored the same way. The country will earn a score of 100 if there is such an agency and 0 if there is not.

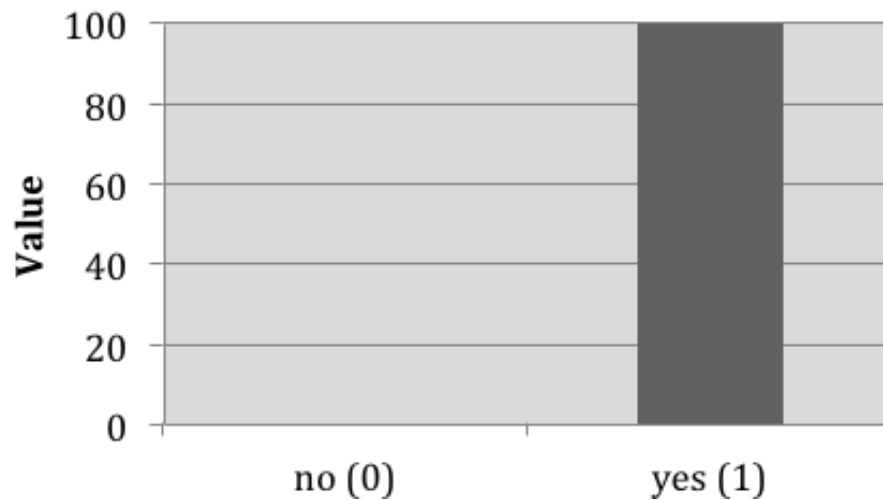


Figure 4.26 Value function for protection agency

4.3.4.6 Piracy Sub-function

Minimize Attempts of Piracy

Piracy is a growing issue on the international level with pirates attacking civilian and military ships in international waters. This value measure assesses the number of attempted pirate attacks in East African waters per year. Kenya, being part of the East African coast, should be actively searching for and investigate pirates and patrolling the seas in order to protect ships within its jurisdiction. The number of pirate attacks in Kenya is affected by how the government deals with the pirates themselves and actively invests in ways to protect ships from pirates. Kenya's initiative to take a more aggressive stance on the pirates will aid to lower the number of attacks in its seas.

In an idealistic world, the goal would be to completely eliminate pirate attacks in the Horn of Africa. As a result figure 4.27 depicts the following, 0 pirates attacks would earn a score of 100 and any more that 4 pirates attacks would be 0.

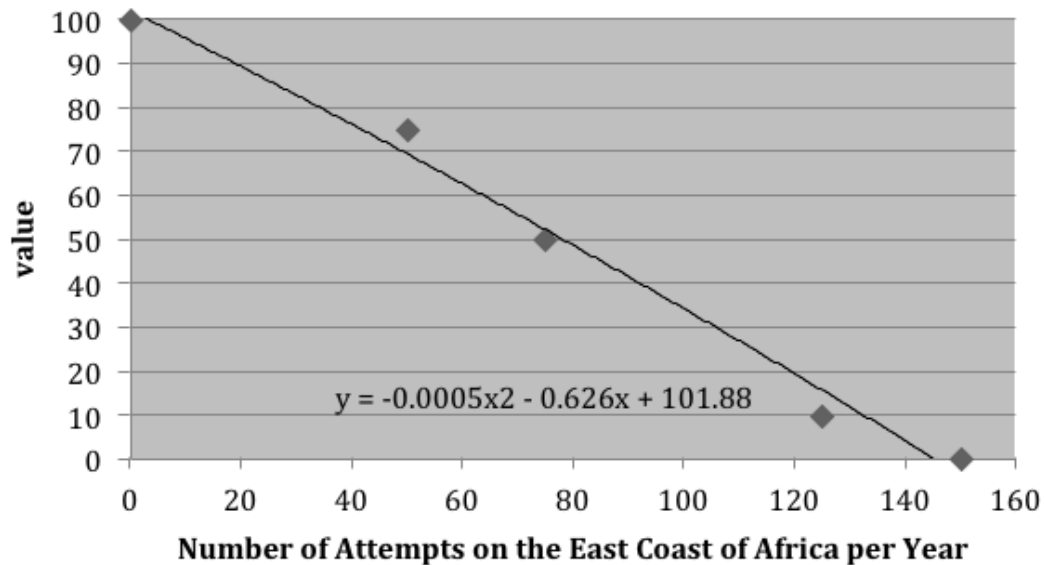


Figure 4.27 Value function for the number of pirate attacks

4.3.4.7 Drug Trafficking Sub-function

Minimize the Amount of Drugs Crossing the Border

Every country has issues with illegal drugs. Illegal drugs range from over the counter medicine to naturally grown herbs. The more illegal substances that are imported or exported, the more unstable the government becomes since they cannot control their borders or population's addictions. This value measure will evaluate the total amount, in thousand kilograms, of Khat seizures in Africa over a year.

Figure 4.28 shows the ideal situation which is 0 kilograms of Khat seized. This would yield a score of 100. Figure 4.28 also shows the worse case scenario which would yield a score of 0 if there are 50 thousand kilograms of Khat or more seized.

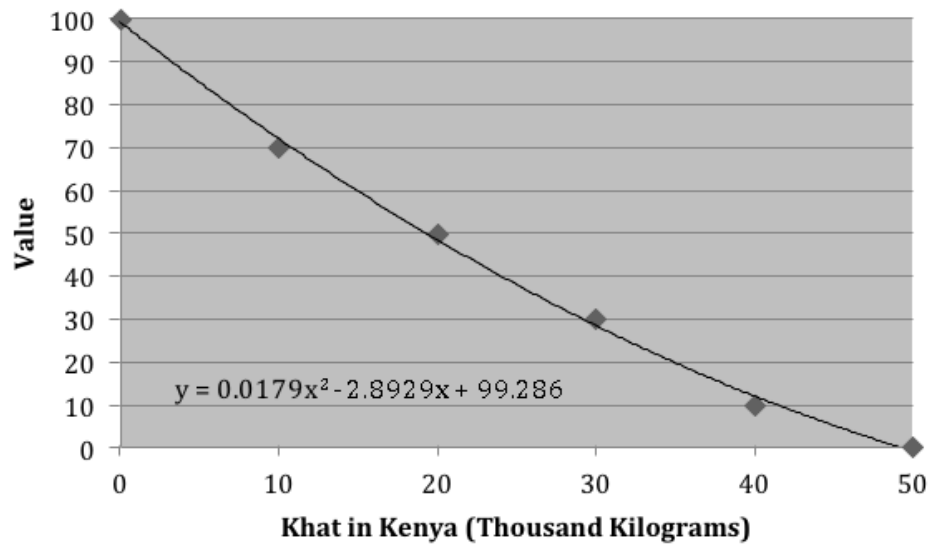


Figure 4.28 Amount of drugs imported and exported

4.4 Swing Weight Matrix

The value model is where we capture the importance of each function and objective. There are many techniques for trying to capture importance. This model does not champion any one particular technique (normally importance or weighting occurs during the stakeholder analysis phase). Table 4.1 describes the swing weight priorities as discussed in Chapter 3.

Table 4.1 Swing weight matrix for Kenya stability index value model

		Importance of the Value Measure to the Decision Makers and Stakeholders		
		High	Medium	Low
Variation in Measure Ranges	High	<ul style="list-style-type: none"> Minimize Number of Terrorists Attacks Percent Unemployed 	<ul style="list-style-type: none"> Size of Military Infant Mortality Rate Inflation Rate 	<ul style="list-style-type: none"> Government IT Organization Labor Participation Rate
	Medium	<ul style="list-style-type: none"> Percentage of Population below Poverty Line Corruption Index 	<ul style="list-style-type: none"> Government Anti-terrorist Organization Citizens Killed or Captured by the Government Tourism Revenue Amount of Drugs Imported/Exported 	<ul style="list-style-type: none"> Number of Attempted Acts of Piracy Investment Climate Ranking
	Low	<ul style="list-style-type: none"> Life Expectancy Defense Budget Spending 	<ul style="list-style-type: none"> Average Annual Income Education Spending HIV/AIDs Deaths per Year 	<ul style="list-style-type: none"> Literacy Rate

4.5 Regional Grouping Methodology

When creating the model for stability indices for Kenya, the different value measures and functions could be examined on many different levels. They have already been broken down into categories based on the type of value function, now it is important to figure out how to organize the final figures. When developing the data format it was decided there are three different options for presenting the data findings; 1) whole country in a single stability index; 2) two larger regional stability indices; or 3) multiple regions and stability indices that could be based on probably ethnic geographic regions.

Figure 4.29 below shows an example of how a multiple regions perspective could be utilized. The color scheme is an example of showing marginal increase or decrease in stability compared to previous years. This grouping was performed based mainly upon geography and tribal affiliations.

As with most models, the data drives the methodology. For the presentation of the final data for this methodology, it was decided to display it as a stability index for the country as a whole. The reason for this is the lack of data available for all of the smaller regions for our value functions. Most data for subjects like this are found on a national level. Further research beyond just the national level may be beneficial for discovering stability index disparities between regions in different parts of Kenya, for example closer to Somalia, or on the Coast, versus the more Western part of the nation.

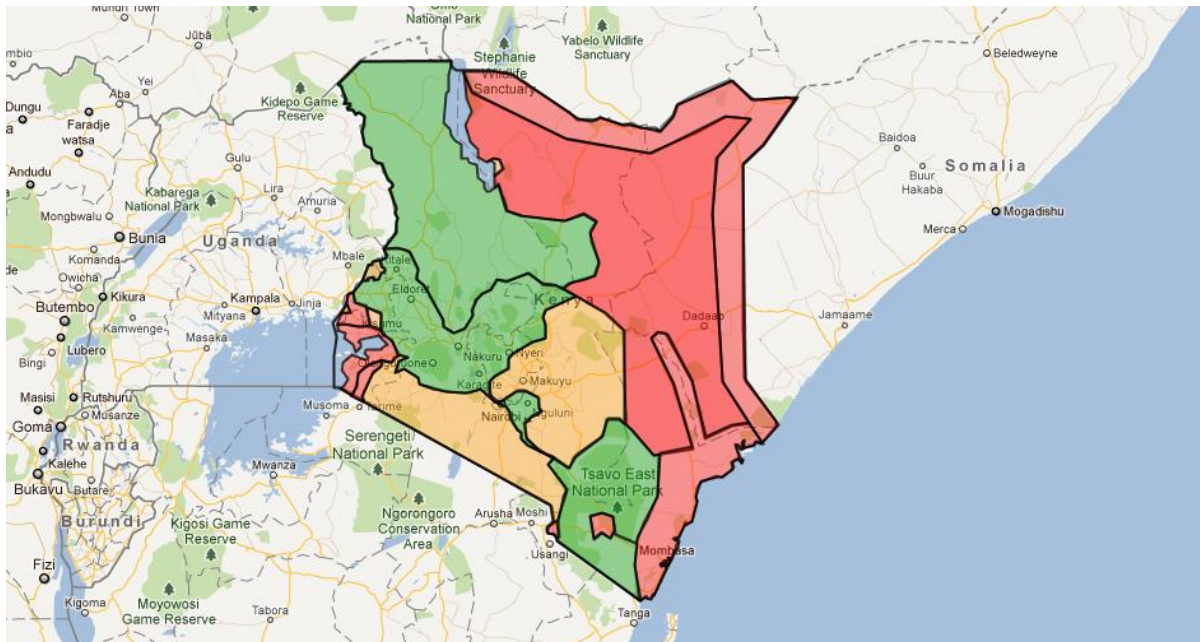


Figure 4.29 Example of regional breakdown of Kenya

4.6 Demonstration Study Results

4.6.1 Stability Profiler Visual Representation Method

After generating our model we were able to use the weighted scores to produce a *Kenyan Stability Profiler*. This figure not only charts the levels of variability in the data from year to year, but it combines the most important value measures to show an annual representation of the country. For instance in 2010 we can see from Figure 4.30 that from 2009 there was a significant decrease in the number of citizens infected with AIDS. This represents not only a continuation of the current trend but also the largest decrease in our model. In a quick snapshot we can use this figure to analyze individual value measures over time, their response to surrounding factors and the overall stability picture within the region. In the future this graph could be broken down into individual components- years, value measures and/or degree of change that would allow additional perspectives with which to view stability across the region. The multiple perspectives and a clear visual representation the *Kenyan Stability Profile* can be used to clearly understand how major measures of stability change over time.

4.6.2 Stop Light Chart

Stoplight charts are named for their traffic signal color code use of red (no or some level of satisfactory performance), yellow (partial or some level of satisfactory performance), green (some level to full performance) provide a simple and effective way to visualize and present metrics to the ultimate decision-makers. Table 4.2 presents a stop light representation of our value measure over the period 2007 through 2010.

4.6.3 Bubble Plot to Capture Magnitude of Change of Value Function

Figure 4.30 below is a bubble chart version of the Swing Weight Matrix. The chart represents marginal change from the data from the year 2009 to the year 2010. The size of the circle represents the size of the change and the color represents the direction, whether positive, negative, or no change. This chart can be used effectively with the stoplight chart, as the stop light chart shows the values discretely by year, and this bubble chart shows the change between two of the years.

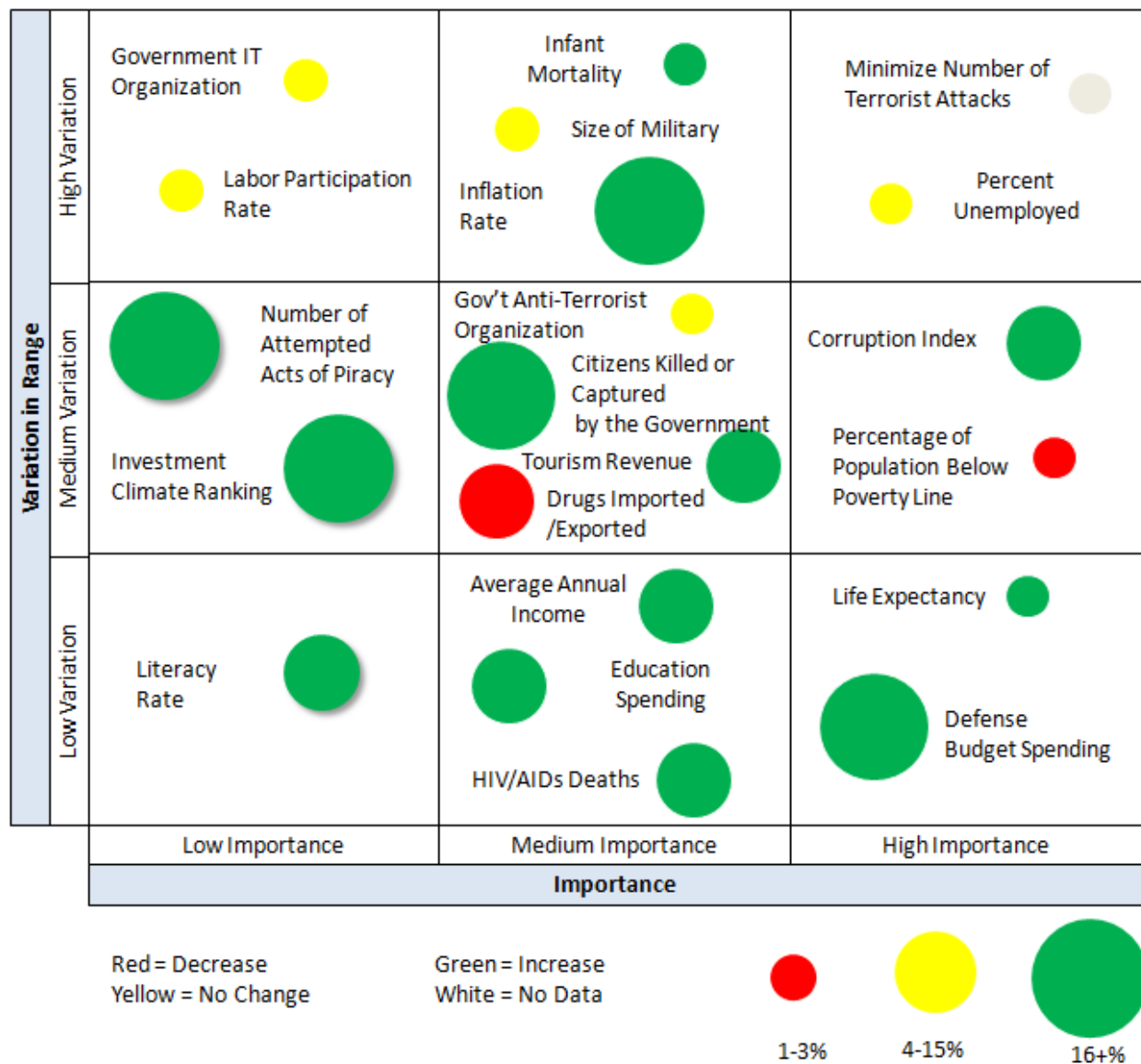


Figure 4.30 Bubble plot of the magnitude of change of the value measures

4.6.4 2007-2011 Kenya Stability Index Values

After scoring each of our weighted value measures we added them together for an aggregate score that presents the stability of Kenya as an index value as shown in Figure 4.31. The higher the index value the more stable the country is based on factors ranging from political, economic and military facets in the region. From our model we calculated a relatively high stability in 2007 that dipped significantly in 2008. However, for the remaining two years we noticed a steady increase in the stability of the region that indicates effective investment and security operations in the region by various non-state actors to include the JTF-HOA presence based in Djibouti. Moreover, one of the most volatile factors in the model was political unrest. This is often out of reach of U.S. civil affairs teams or other agencies, yet we see a significant decrease in the amount of unrest in the years of 2009-2010 which can be attributed to the success of the other measures outside supports took to minimize overall instability in the region. Looking ahead we would expect this stability index to increase as long as the conditions established in 2009-2010 persist and are adjusted to meet the changing needs of the region.

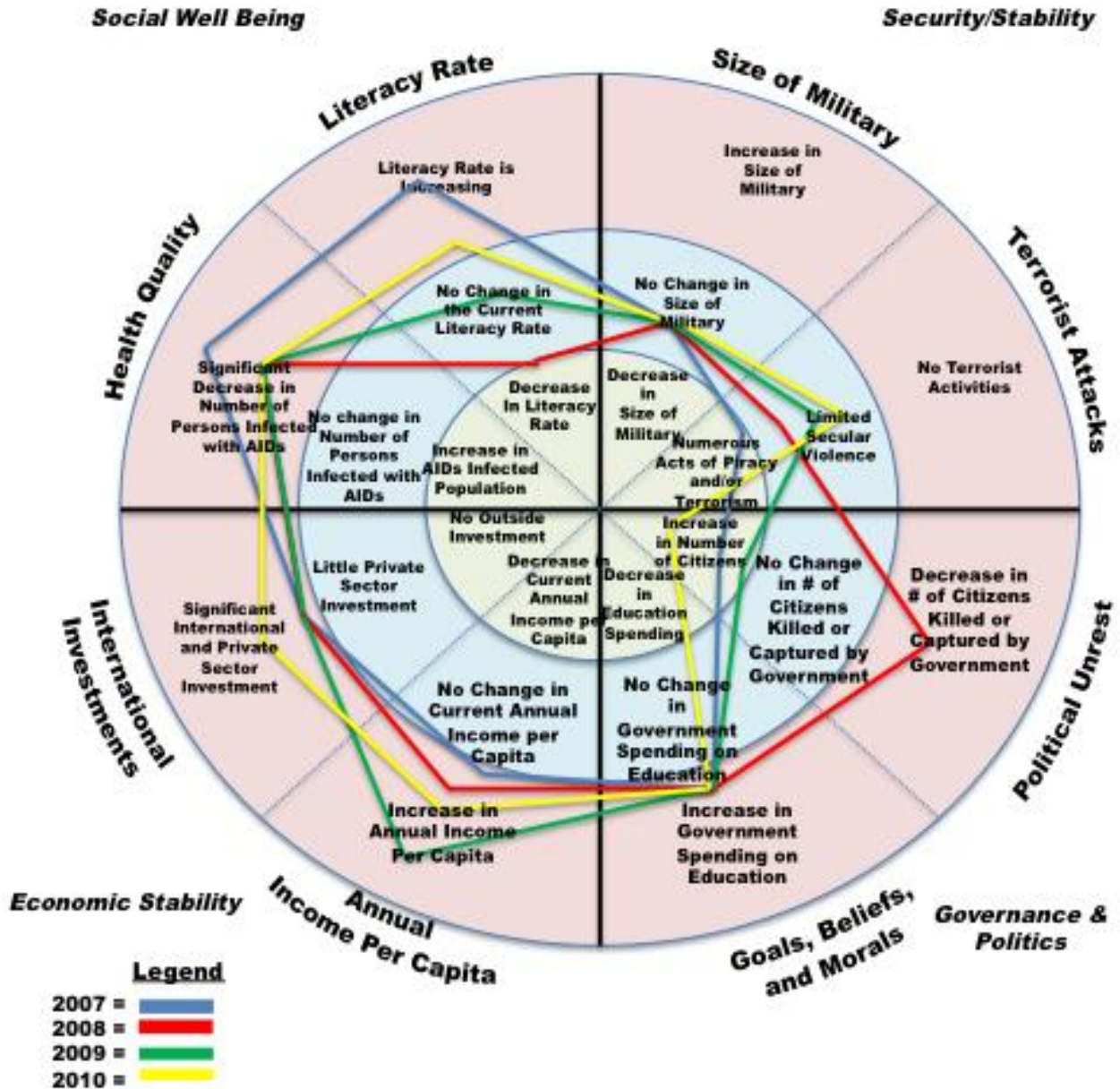


Figure 4.31 Kenya stability profiler



Table 4.2 Stop light chart for our assessment value measures from 2007 to 2010

Function	Sub-Function	Value Measure	2007	2008	2009	2010
Governance and Politics	Military and Govt Corruption	Minimize Corruption Index (#)				
	Country Health Status	Minimize Infant Mortality Rate (Deaths/1000 Births)		NI ^{II}	NI ^{III}	
	Political Unrest	Minimize Citizens Killed or Captured by the Govt (#)				
	Parallel Beliefs, Goals, and Morals	Maximize Education Spending (% of Govt Budget)	NI ^{III}	NI ^{III}	NI ^{III}	
Economy	Strong Economy	Minimize Percent Unemployed (%)				
		Maximize Average Annual Income				
		Optimize Inflation Rate (%)				
		Maximize Investment Climate Ranking (#)				
	Private Sector Development	Maximize Tourism Revenue (\$ Mil)				
Social Well Being	Poverty	Minimize % of Population Below Poverty Line (%)		NI ^{II}	NI ^{III}	
	Conflict between Ethnic Groups	Maximize Labor Participation Rate (%)				NI ^{II}
	Pandemic Influenza and Decease	Minimize HIV/AIDs Infection (Deaths/Year)				NI ^{II}
	Life Expectancy	Maximize Life Expectancy (Yrs)				NI ^{II}
	Education	Maximize Literacy Rate (%)				NI ^{II}
Security	Terrorism	Minimize Terrorism Attacks (# of Attacks/Year)	NI ^I	NI ^I	NI ^I	NI ^I
	Size of Military	Maximize Size of Military (% Military per Labor Force)				
	Defense Budget	Maximize Government Defense Expenditures (% of GDP)				
	Internet Monitoring	Existence of Cyberspace Monitoring Activity (Y/N)				
	Federal Force Protection Agency	Existence of Govt Anti-Terrorism/Force Protection Agency (Y/N)				
	Piracy	Minimize Attempted Acts of Piracy (# of Attempted Acts/Year)				
	Drug Trafficking	Minimize #vof Drugs Crossing the Border (1000 Kg Khat/Yr)				

Description:

Frequency by Year:

	= Value between 66 - 100	8	7	5	8
	= Value between 33 - 66	6	6	8	7
	= Value between 0 - 33	7	8	8	6
NI	= No Information Found				

^I = Use estimated values ^{II} = Used value from earlier year ^{III} = Used value from following year

4.6 Weighted Stability Score Comparison with Other Indices

Taking a look at Figure 4.32, we see that since the year 2008 the weighted stability score has steadily been increasing, indicating an increase in stability within Kenya. The different factors that have contributed to more stability in Kenya within the economic stability function includes: the increase in national tourism revenue, Kenya's rank as top three in investment climate ranking in Africa, and increase in average annual income. In terms of the governance political function, these factors increased Kenya's stability: the decrease in infant mortality rate, increase in education spending, and decrease in the corruption index. Within the social well being function, increases in Kenya's stability was attributed to the following factors: increase in labor participation percentage, decreases in deaths related to HIV/AIDS, increase in life expectancy, and increases in literacy rate. Finally within the security stability function, these measurements: the increase in defense spending as a percentage to the GDP, increase in government monitoring of cyber-space activity, and presence of a force protection agency, have contributed to more stability within Kenya.

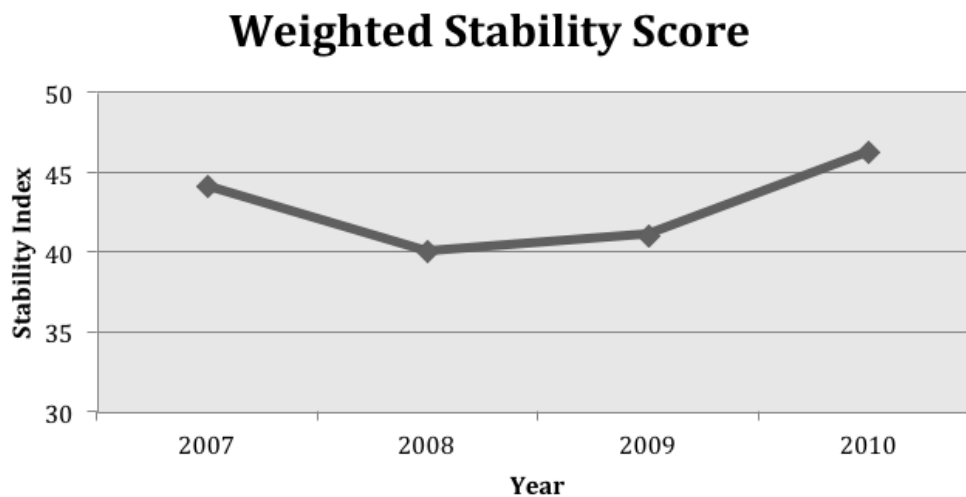


Figure 4.32 Kenya stability score from 2007 to 2010

In order to depict the degree of change across the areas analyzed in our model we generated a stacked bar chart (see below, Figure 4.33). The bars are delineated by year and show the relative change in each of the four categories analyzed: political, economic, social well-being and security. Surprisingly, with little in the way of economic reforms from the government it seems to be the driving factor in the increased stability of the nation as of 2010. Additionally, in 2008 and 2009 economics also seems to be the driving factor in the overall stability in those years.

Looking back at Figure 4.31 it appears that while Political Unrest and Governance and Politics is decreasing, Social Well Being is increasing, this is different than what is seen in Figure 4.33 below. As seen in our stacked bar chart, it appears that all of the values remain mostly constant while economics is causing the stability increase over the years. The reason that these two charts, the Radar Plot and the Stacked Bar Graph, don't lineup is because while the Radar plot is a very effective method of displaying the value measure over time, it is merely a snap shot of 2 sub-functions from each function. The stacked bar chart shows a holistic view of the analysis and includes value from every sub-function.

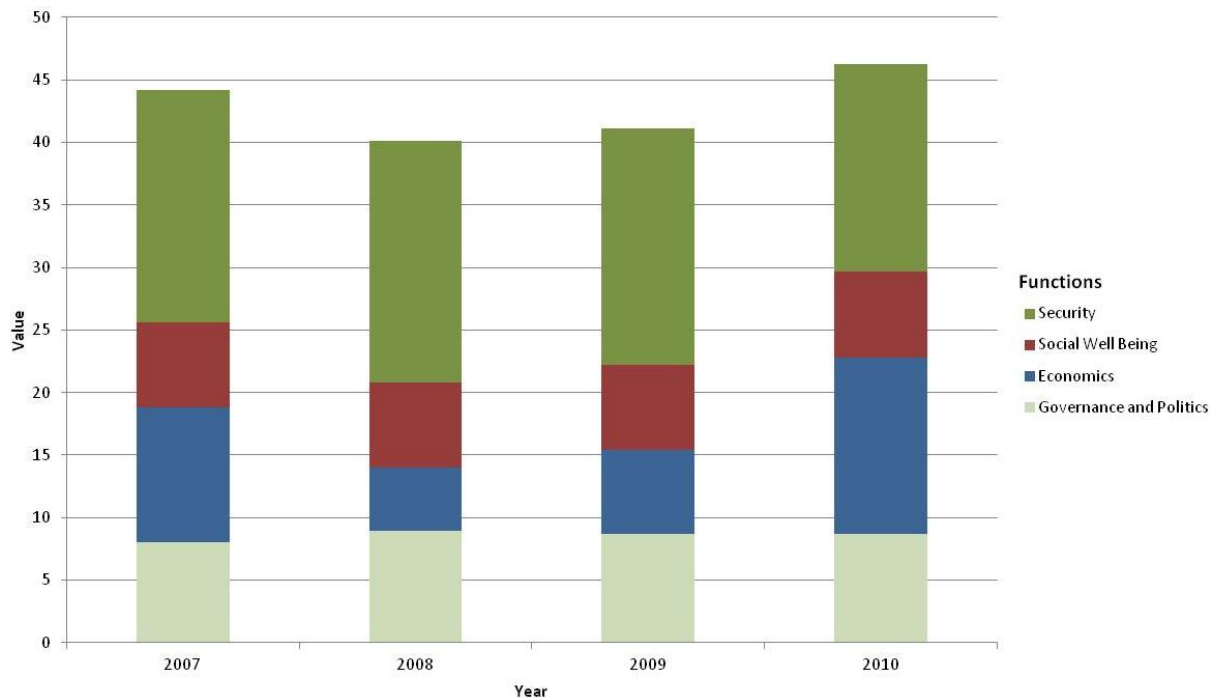


Figure 4.33 Total value stacked bar chart

Multi-Year Pressures Trend

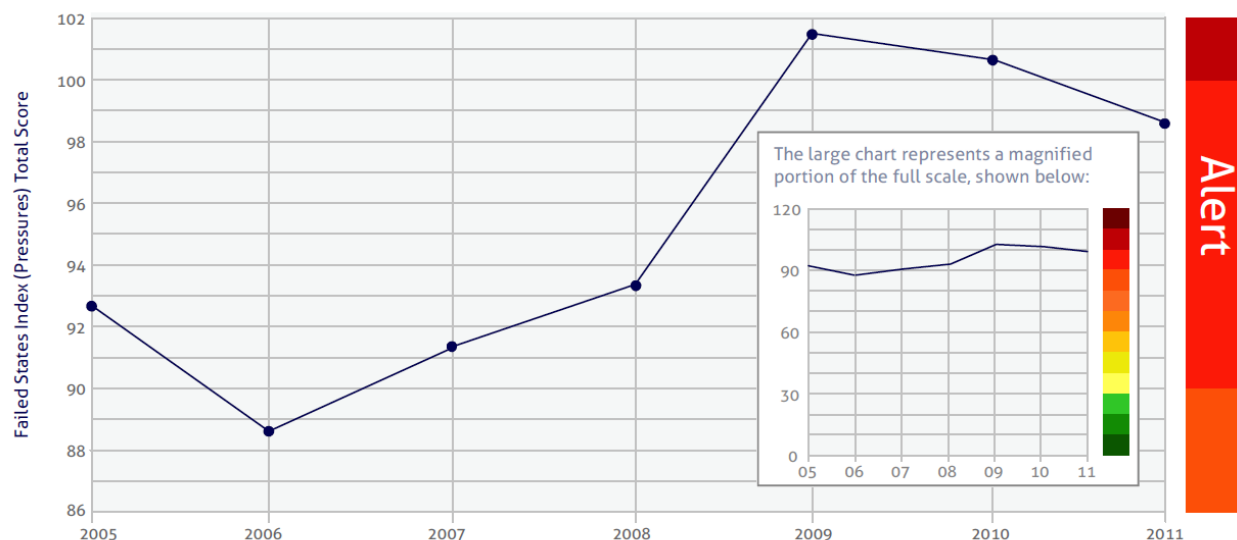


Figure 4.34 Fund for peace failed states index on Kenya

The index depicts that from 2009 to 2011 the failed index score has been dropping showing more stability within Kenya. This corresponds to the data that we have from year 2009 to 2010 (Figure 4.31) which depicts that the stability in Kenya has been improving during 2009 and 2010.

The political instability index from the Economist magazine shows that Kenya's political situation has become more unstable with its score increasing from 6.5 to 7.5 which is approximately a 15% decrease in Kenya's political stability. In our own political function value measures, we see that out of four value measures two measures that decreases stability in Kenya, infant mortality rate and citizens killed or captured, both have significant weights in our model that contribute to a lower stability score. Therefore, our model's political portion corresponds to the decrease in stability that the political instability index from the Economist magazine depicts. However, our overall model depicts an increase in stability because of the other factors that we input into the model such as the economic, social, and security factors which combined have a greater weight than the government and political section of our model.

Chapter 5

Conclusion and Summary

5.1 Conclusion

To understand the data and the results of the MODA model, calculations and computation one has to look into what drives the outcome. According to the swing weight matrix the values with the most effect to the overall stability score of Kenya are Terrorist Attacks, Percent Unemployed, Percentage of Population Below Poverty Line and Corruption Index. These four have a swing weight score of 100, 100, 80, and 80 respectively. These scores account for 9.0% and 7.2% of the overall total value score. Terrorist Attacks is not accounted for in the final score because the data for this event could not be compiled, but when it is the total value could change significantly. The stability rating will generally go how these four values fair out. If all four prove to be stable Kenya will be stable and vice versa. This report can be used as a starting point. An official can look at this as see which vales (areas of the country) make Kenya stable and continual to work on though and see which values drive Kenya to instability and re-up the program(s) that affect those values. This model can be modified to fit any country. We would just change some of the value measures that are more relevant to the particular country. A few of the value measures will be consistent no matter the country because they are important even if the country is the United States or a new independent country like South Sudan. Said value measure could be terrorist attacks and average income for example.

5.2 Summary

This research was conducted to develop implementable and sustainable MPTs for the DoD to utilized in order to predict instability in Kenya. The problem statement for this research is, CJTF-HOA is the only official permanent DoD presence on the continent of Africa and is responsible through AFRICOM for the assessment of U.S. Government military activities. Through CA teams, open sources, other government agencies, etc., they are responsible for assessing how government projects contribute to security, improved governance, and economic development. They should also contribute to the situational awareness as a key member of the whole government team. Another purpose of this research is to review and make recommendations of the current assessment methodology. This research starts off with an understanding of CJTF-HOA's mission, area of responsibility, and interests as outlined in Chapter 1, all with the goal of understanding the stakeholder (CJTF-HOA) requirements. The methodology used is the SDP. The SDP is a comprehensive and proven method for problem solving and decision-making.

Chapter 2 of the report is the literary review. Research was conducted to see what research has been done previously to predict future instabilities in countries. Four different assessment methodologies were found: the FFP, Sudan Conflict Indication Model, PII, and PGSI. All of methodologies systematically came up with their own criteria that they deemed important enough to score as to assess the current stability situation or predict future instability. They all scored their criteria/indices in their own distinct method, all them withheld their process or scoring system from the public, in order to put an individual value to every country they looked at. The level of instability or stability depended on what a country scored.

Chapter 3 is a review of the work that has CJTF-HOA has already done, the current system they have in place and what this report will do and how Kenya will be scored. CJTF-HOA had defined fundamental objectives for specific regions, describe their desired effects for said regions, and create different missions to accomplish their goals. Once everything they wanted to achieve was laid out they assessed the progress both qualitatively and quantitatively. For every objective and mission there are developed measures of effectiveness and measures of performance. These assessments are done on every echelon of the objective and then summarized to give overall effect levels for the fundamental objectives and for all of Kenya on a quarterly basis. The assessment does not give any indication of future issues. Based off their analysis there is no way to predict the future. The quarterly assessment results consist of a summarized description of the main objectives labeled based on their current progress in effectiveness,

and the amount of evidence and confidence with which they can prove the effectiveness. Once CJTF-HOA's method was described the second half of Chapter 3 is devoted to the method that was recommended, MODA. MODA is a mathematical technique used to evaluate alternatives, in this case, Kenya. MODA measures, scores, and weighs values to come up with an outcome. Based off this outcome Kenya was evaluated and assessed.

Chapter 4 is a demonstration of how the MODA is used to score Kenya. Chapter 4 starts off with a brief history of Kenya and why Kenya is important to the United States. The 16 value measures that were used to score Kenya are described and weighed in this chapter. We used a radar plot and a stop light chart to show how these value measures have changed over time. The bubble chart shows the swing weight matrix and how the values measures have changed of the course of a year. There are different sized bubbles that represent the size of the change in the form of a percentage and different colors to represent the change as a positive or negative change. Lastly, we presented the MODA results from 2007 through 2010. We did compare our results with the FFP failed states index. Both showed that the situation has slightly improved from 2009 to 2010.

With results of our methodology the next dynamic we must examine is what decisions will be driven by these results. However, seeing as this methodology was created for the assessment teams of CJTF-HOA, the ultimate decision making will be on their part. Assessment without decisions being driven the results, or assessment that is not driven by that needs to be made is a waste of resources. The intent for this methodology was essentially to quantify instability and show where the major causes of instability come from. Some decisions that could be made from the results of this analysis are to look at what biggest value measures that are cause instability and focus additional resources on that area. Or you could use this analysis to observe where the most room for improved stability is and focus on that.

5.3 Acknowledgments

This research was funded under the *Cultural Reasoning and Ethnographic Analysis for the Tactical Environment (CREATE)* program for the Engineer Research and Development Center (ERDC). The CREATE effort is directed to providing knowledge, methods, and computational tools to inform planning for civil-military operations. Mr. Tim Perkins is the program manager for CREATE at ERDC. The authors are grateful for the ERDC support and the opportunity to conduct research in this arena.

Chapter 6

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Appendix A

Raw Data Input

Tables A.1 through A.4 contain the data associated with the various value measure and are organized according to the appropriate sub-functions. All of this data was collected from legitimate sources or assumed based on the subject matter expert opinions or trends in partial data sets. Once compiled, these data points were all plugged into their sub-functions value function seen in Chapter 4, and then multiplied by the swing weight. These two steps normalize the data to be on a scale of 0 to 100 first, then normalize the importance of each sub-function with respect to the other value measures. With these weighted values it is possible to calculate a total value score for each year. These value scores are visually presented in Figure 4.30.

Table A.1 Government and politics sub function raw data

Function	Government and Politics			
Year/Sub-function:	Corruption Index	Infant Mortality Rate (Deaths/1000 Born)	Citizens Killed or Captured (Number)	Education Spending (% of GDP)
2006	-	95	-	14.4
2007	29	92	1333	15.1
2008	45	89	405	15.8
2009	45	87	660	16.5
2010	32	85	1200	17.2
2011	29	83	1006	-

Table A.2 Economy sub function raw data

Function	Economy					
Year/Sub-function	Percent Unemployed (%)	Average Annual Income (\$)	Inflation Rate (%)	Investment Climate Ranking	Tourism Revenue (\$ Mil)	Percentage of Population Below Poverty Line (%)
2006	40	439	6.041	4	-	44.4
2007	40	456	4.256	4	773.5500	45.9
2008	40	478	15.101	4	478.6979	46.4
2009	40	730	10.552	4	703.9675	46.9
2010	40	770	4.086	3	810.0000	47.3
2011	40	800	-	-	-	-

Table A.3 Social well being sub function raw data

Function	Social Well Being			
Year/Sub-function:	Labor Participati on Rate (%)	HIV/AIDs (Deaths/Year)	Life Expectancy (Yrs)	Literacy Rate (%)
2006	81.7	115000	53.7	62
2007	81.8	100000	54.4	82.8
2008	81.8	90000	55.1	82.5
2009	81.9	80000	55.8	87
2010	-	-	-	-
2011	-	-	-	-

Table A.4 Security sub function raw data

Function	Security						
Year/Sub-function	Terrorism Attacks	Size of Military (% Military per Labor Force)	Size DoD Budget (% of GDP)	Internet Monitor- ing	Force Protection agency	Number of Attempt ed Acts of Piracy per Yr	Amount of Drugs Imported/ Exported (1000 Kg Khat/Yr)
2006	-	0.2	1.7	1	1	17	5.7
2007	-	0.2	1.8	1	1	33	2.5
2008	-	0.2	1.9	1	1	73	6.2 9
2009	-	0.2	1.9	1	1	163	23.4
2010	-	0.2	1.9	1	1	124	25
2011	-	0.2	2.8	1	1	-	-

Figure A.5 above depicts the entire quantitative model we used to generate the weighted scoring indices for our Kenyan Stability Index. All of the raw data was inputted in the top of the excel sheet, than manipulated sequentially based on the weights assigned in the swing weight matrix. In the third row the values were then normalized and linked to the additive model equations to output a total value in the bottom right corner of the model.

Table A.5 Excel implementation of the value mode

Raw Data Matrix: obtained from factual research & expert estimates											
Measure ref:											
Candidate Solution	Corruption Index	Infant Mortality Rate (Deaths/1000 Born)	Citizens Killed or Captured (#)	Education Spending (% of GDP)	Percent Unemployed (%)	Average Annual Income (\$)	Inflation Rate (%)	Investment Climate Ranking	Tourism Revenue (\$ Mil)	Percentage of Population Below Poverty Line (%)	Labor Participation Rate (%)
2006	-	95	-	14.4	40	439	6.041	4	-	44.4	81.7
2007	29	92	1333	15.1	40	456	4.256	4	773.5500	45.9	81.8
2008	45	89	405	15.8	40	478	15.101	4	478.6979	46.4	81.8
2009	45	87	660	16.5	40	730	10.552	4	703.9675	46.9	81.9
2010	32	85	1200	17.2	40	770	4.086	3	810.0000	47.3	-
2011	29	83	1006	-	40	800	-	-	-	-	-
Ideal	1.00	25.00	0	26	0	913	2	1	935.0000	-	-
Value Matrix: translates raw data scores into value											
Candidate Solution	Corruption Index	Infant Mortality Rate	Citizens Killed or Captured	Education Spending	Percent Unemployed	Average Annual Income	Inflation Rate	Investment Climate Ranking	Tourism Revenue	Percentage of Population Below Poverty Line	Labor Participation Rate
2006	0.0	26.0		75.0	45.9	0.0	49.6	50.0			86.7
2007	9.4	40.1	62.0	75.0	45.9	0.0	66.7	50.0	34.4	25.3	86.8
2008	0.0	52.7	80.3	75.0	45.9	0.0	0.0	50.0	0.0	24.0	86.8
2009	0.0	60.4	63.6	75.0	45.9	50.0	0.0	50.0	6.6	22.7	86.9
2010	0.3	67.3	53.5	75.0	45.9	61.0	68.4	100.0	49.0	21.4	87.0
2011	10.0		50.4	0.0							
Ideal	96.9	100.0	100.0	100.0	97.4	100.0	91.8	100.0	99.0	100.0	100.0

Raw Data Matrix: obtained from factual research & expert estimates										
Measure ref:										
Candidate Solution	HIV/AIDs Deaths/Year	Life Expectancy (Yrs)	Literacy Rate (%)	Terrorism Attacks*	Size of Military (% Military per Labor Force)	Size DoD Budget (% of GDP)	Internet Monitoring	Force Protection agency	Number of Attempted Acts of Piracy per Yr	Amount of Drugs Imported/Exported (1000 Kg Khat/Yr)
2006	115000	53.7	62	-	0.2	1.7	1	1	17	5.691
2007	100000	54.4	82.8	-	0.2	1.8	1	1	33	2.49
2008	90000	55.1	82.5	-	0.2	1.9	1	1	73	6.219
2009	80000	55.8	87	-	0.2	1.9	1	1	163	23.442
2010	-	-	-	-	0.2	1.9	1	1	124	25
2011	-	-	-	-	0.2	2.8	1	1	-	-
Ideal	-	-	-	-	3	10	1	1	0	0
Value Matrix: translates raw data scores into value										
Candidate Solution	HIV/AIDs Deaths/Year	Life Expectancy	Literacy Rate	Terrorism Attacks	Size of Military	Size DoD Budget	Internet Monitoring	Force Protection agency	Number of Attempted Acts of Piracy	Amount of Drugs Imported/Exported
2006	0.0	17.4	72.0	30.0	7.7	35.4	100.0	100.0	91.0	83.4
2007	0.0	18.8	87.8	35.0	7.7	37.1	100.0	100.0	80.6	92.2
2008	1.0	20.2	87.5	40.0	7.7	38.7	100.0	100.0	53.4	82.0
2009	2.0	21.6	92.0	45.0	7.7	38.7	100.0	100.0	0.0	41.3
2010	3.0	23.0	94.0	50.0	7.7	38.7	100.0	100.0	16.5	38.2
2011				55.0	7.7	51.5	100.0	100.0		
Ideal	100.0	100.0	100.0	100.0	99.5	100.1	100.0	100.0	101.8	99.3

Table A.5 (Continued) Excel implementation of the value mode



Measure Weights: normalized measure swing weights											
	Corruption Index	Infant Mortality Rate	Citizens Killed or Captured	Education Spending	Percent Unemployed	Average Annual Income	Inflation Rate	Investment Climate Ranking	Tourism Revenue	Percentage of Population Below Poverty Line	Labor Participation Rate
Swt	80	70	50	30	100	30	70	20	50	80	40
Mwt	0.072	0.063	0.045	0.027	0.090	0.027	0.063	0.018	0.045	0.072	0.036
Additive Value Model: weighted total value											
Candidate Solution	Corruption Index	Infant Mortality Rate	Citizens Killed or Captured	Education Spending	Percent Unemployed	Average Annual Income	Inflation Rate	Investment Climate Ranking	Tourism Revenue	Percentage of Population Below	Labor Participation Rate
2007	0.7	2.5	2.8	2.0	4.1	0.0	4.2	0.9	1.6	1.8	3.1
2008	0.0	3.3	3.6	2.0	4.1	0.0	0.0	0.9	0.0	1.7	3.1
2009	0.0	3.8	2.9	2.0	4.1	1.4	0.0	0.9	0.3	1.6	3.1
2010	0.0	4.2	2.4	2.0	4.1	1.6	4.3	1.8	2.2	1.5	3.1
Ideal	7.0	6.3	4.5	2.7	8.8	2.7	5.8	1.8	4.5	7.2	3.6

Table A.5 (Continued) Excel implementation of the value mode

Measure Weights: normalized measure swing weights										
	HIV/AIDS Deaths/Year	Life Expectancy	Literacy Rate	Terrorism Attacks	Size of Military	Size DoD Budget	Internet Monitoring	Force Protection agency	Number of Attempted Acts of Piracy	Amount of Drugs Imported/Exported
Swt	30	60	10	100	70	60	40	50	20	50
Mwt	0.027	0.054	0.009	0.090	0.063	0.054	0.036	0.045	0.018	0.045
Additive Value Model: weighted total value										
Candidate Solution	HIV/AIDS Deaths/Year	Life Expectancy	Literacy Rate	Terrorism Attacks	Size of Military	Size DoD Budget	Internet Monitoring	Force Protection agency	Number of Attempted Acts of Piracy	Amount of Drugs Imported/Exp
2007	0.0	1.0	0.8	2.7	0.5	1.9	3.6	4.5	1.6	3.8
2008	0.0	1.1	0.8	3.2	0.5	2.0	3.6	4.5	1.5	4.2
2009	0.1	1.2	0.8	3.6	0.5	2.1	3.6	4.5	1.0	3.7
2010	0.1	1.2	0.8	4.1	0.5	2.1	3.6	4.5	0.0	1.9
Ideal	2.7	5.4	0.9	4.5	0.5	2.1	3.6	4.5	0.3	1.7

Table A.5 (Continued) Excel implementation of the value mode



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